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Electrical Review

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Index to Advertisers—See page lxxii.

Principal Contents:

	PAGE
The President's Address	807
Leaderettes	808
The National Electrical Convention	809
The Presidential Address. By E. E. Hoadley	815
A Symposium of Views	816
Industrial Power Supply	817
Domestic Electrical Development	818
The Electric Vehicle Display at Bournemouth	819
Cooking and Heating Developments	820
Impressions of the Exhibition	821
Some Particulars of the Exhibits	822
Power Supply Prospects. By W. B. Woodhouse	829
The Heat Insulation of Storage Tanks. By E. Chisholm	830
The Development of Distribution. By L. Romero	831
Electric Cookers. By E. A. Mills	832
Dairy Farming. By F. E. Rowland	833
Sub-station Earthing. By F. A. Ellis	834
Operation Under the Grid. By S. A. Russell	836
A.C. Integrating Meters. By Oliver Howarth	837
Lamp Rating Economics. By D. J. Bolton	838
The New President of the I.M.E.A.	840
A 400-kV X-ray Installation	840
Colonel Crompton's Ninetieth Birthday	841
I.E.E. Council Nominations	841
A Neon Turret Clock. By T. R. Robinson	842
The Late Mr. D. N. Dunlop	843
Correspondence: Works Visits; Unauthorised Discounts; Trolley-bus Accidents	844
Business and Industrial Notes	845
Electricity Supply	848
Traction and Communications	850
Contract Information	851
Our Personal Column	853
Financial Section	854
Stocks and Shares	855
Published Specifications	857
New Work for Contractors	858

The President's Address

IN the opening paragraphs of what he unjustly described as a commonplace address, delivered at Bournemouth on Tuesday, Mr. E. E. Hoadley mentioned that what had brought so many electrical people to the conference was the conviction that the time had arrived for all to pull together to secure greater expansion of the industry. Some who were present may have long ago felt that the need existed and that the time was ripe, but they found the obstacles in the path too much for them.

The President had so much ground to cover that he was, of course, unable to be complete in his references to the genesis of the National Convention. In giving credit in very deserving directions, he said that the matter was "afterwards" discussed "in the Press," but access to the volumes of the ELECTRICAL REVIEW afford evidence that the idea had been advanced, discussed and urged in these pages for very many years, dating from the early days when we thought it a pity that "central station engineers" controlling municipal undertakings did not meet conjointly with equally eminent engineers who were serving private companies. The example of the American National Electric Light Association in the days of its very successful conventions was also constantly in mind here.

But our own attention to the subject is a matter of far less consequence to us than the credit that is due elsewhere, as very long ago E.D.A. had before it a very detailed scheme for a National Electrical Convention, prepared by its first Director, Mr. J. W. Beauchamp. It was dated July, 1927, and suggested that the first Convention should be held a few years later at a date which could be described as the "Jubilee of Public Electricity Service in Great Britain," and at a time when the work of the Commissioners and the Central Board would be more mature, affording a notable story for the Press.

That he was a man of foresight is obvious from his recommendation that it should be made a topic of interest amongst the Press and people inside the industry, causing valuable ideas to emerge. Even such matters as the various sections meeting in different halls, the number of papers and their subjects, and the holding of a National Exhibition were covered by him.

There was so much of interest in the president's address that it is difficult to do justice to all the subjects touched upon. We must for present purposes treat it as introductory to the general proceedings to which so many others subsequently made important contributions.

The speaker indicated that this year's Convention could not have been held successfully, and perhaps even not at all, without the co-operation of the I.M.E.A. Whatever may be the previous history of the movement, we are all indebted to Mr. Hoadley for the part he played in securing the decision of that body in September last "by a large majority" to take part "for one occasion only," and for the way in which he has worked to secure the success of the gathering, of the necessity for which he was most strongly convinced.

We shall all join with him in the desire expressed in his closing words, that the Convention may "be the beginning of a new spirit and greater co-operation throughout the industry." The formation of a National Electrical Council to ensure co-operation between all sections was elaborated and may be profitably discussed later when we have before us the views of various associations expressed at Bournemouth this week.

Distribution Questions

RIGHT at the forefront of the distribution problems that call for early solution, Mr. Hoadley placed voltage standardisation, thus reinforcing the emphatic opinion expressed by Mr. L. Romero in this issue. The present multiplicity of voltages is a greater obstacle to development than is represented by even the increased cost of lamps and apparatus for which it is responsible. It destroys the confidence of the public (which cannot be expected to appreciate the historical reasons that have led to the present chaos) in the ability of the electrical industry to tackle an anomaly which causes serious inconvenience and expense. The abuse of ingenuity shown in constructing "scientific" tariffs, based on an academic idea of strict equity, and serving them up to the public in this crude form, does not now afflict the industry as it once did, but there has been little reduction in the confusing number of charges in force. Even now over a hundred undertakings offer no two-part tariff. The President referred to three possible bases for the primary charge, but as floor area, which is quite as good as the others, was recommended by the Commissioners' Committee in 1930, it should hold the field. On the more technical aspect of distribution, Mr. Hoadley submitted that heating of conductors and not voltage drop should determine the carrying capacity of cables.

The Honours List

PERHAPS the chief interest in the Honours List published last Monday centres in the Knighthood conferred upon Dr. S. L. Pearce, engineer-in-chief of the London Power Company. We are sure that, in offering congratulations to Dr. Pearce upon this well-merited recognition of his services to the electricity supply industry, we shall be carrying our readers with us. Another name, not so intimately associated with electrical affairs, but that of one who has been very deeply interested in all our problems of trade and industry both before and during the sitting of the "Balfour Committee," is that of Sir Arthur Balfour, Bt., of Sheffield, who is created a baron for public services. Mr. Noel Ashbridge's knighthood is a well-deserved recognition which reflects honour on the electrical industry.

The National Proving House

THE advantages of a national proving house, which were discussed by Mr. T. C. Gilbert in our last issue, were mentioned not only in Mr. Hoadley's address but also by all the authors of the three-part paper on "Domestic Electrical Development"—Miss C. Haslett, Mr. T. E. Alger and Messrs. W. N. C. Clinch and C. B. Nadaud. The majority of these would definitely limit its scope to considerations of safety of the consumer. In this they are wise, as there is not likely to be any more difference of opinion on this aspect than there was when Mr. C. H. Wordingham advocated this course as president of the I.E.E. The question is closely allied to that of standardisation of the design details from which, nevertheless, it should be kept distinct—however desirable interchangeability and other matters may be in the interests of the consumer—if there is to be a universal minimum standard of safety.

Large Power Users

THAT the negotiation of contracts with power users is one of the most complex tasks of the supply engineer should be clear enough from the Convention paper of Messrs. F. Forrest, H. Hobson and C. D. Taite, which amplifies the statement of the case for the public supply of electricity to industrial works made by the authors at the Scandinavian World Power Conference. Of especial interest is the table which sets out the comparative items of cost in the production of steam and of electricity, as it is on the question whether all relevant expenditure, properly weighted, has been included that so many promising negotiations break down. The openings for a vast extension of power development are clearly shown and on the principle that the greater includes the less the authors attack the position of the pass-out turbine, waste-heat, and large high load factor supplies. In their claims in this field they receive support from the article that Mr. W. B. Woodhouse contributes to this issue—a point for emphasis being that the most economic solution may be found in collaboration between the private plant owner and the supply authority. These are users that do not lend themselves to the simple ready-made tariffs that are essential in the domestic field.

Death of Mr. Dunlop

MR. D. N. DUNLOP was so long and so prominently associated with electrical affairs in his capacity as Director of the British Electrical and Allied Manufacturers' Association, that the industry will at first seem strange without him to turn to. He had an exceptional knowledge of electrical affairs and naturally watched them from the special standpoint of the manufacturers. From the year 1911, when the Association superseded the original and much smaller body, down to his death on Friday last, he was continuously engaged upon some question of policy or of organisation. Frequently, conceptions for strengthening some of the weak places of the electrical industry were his own and they received the support of members concerned, but more frequently, and quite naturally so, it fell to him and to the staff of experts associated with him, to interpret and carry tactfully into execution the ideas of groups or committees. The difficult nature of the task seemed to please him rather than otherwise; it certainly gave him the opportunity to face problems, sections and the work of conciliation, with that philosophic calm and resourcefulness which were among his outstanding characteristics. He had always favoured co-operation in some form or other and amongst his latest interests was the Fair Trading Council of which he was the chairman.

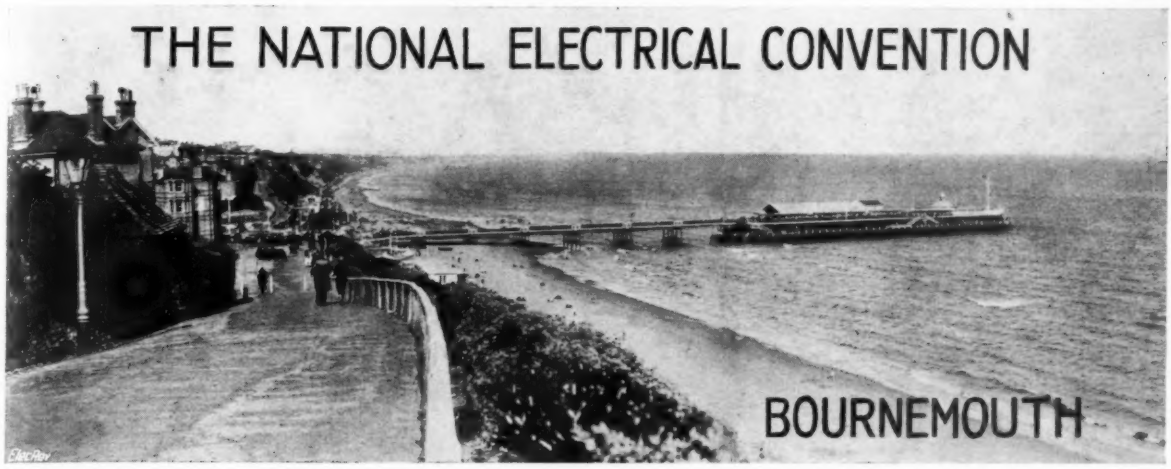
The I.E.E. Council

THE choice of Mr. J. M. Kennedy as President of the Institution of Electrical Engineers, as from October 1st, is a sign that we are to have no rest from thought regarding the important problems that confront our industry. Mr. Kennedy was intimately concerned with the technical problems involved in the construction of the grid, and his paper in the 1932-33 session dealing with the reorganisation of distribution gave us all much to think about. Railway electrification is another of his subjects. Nominations of the Council that strengthen the position of research are Mr. A. P. M. Fleming, as vice-president, and Mr. F. E. S. Ockenden, in addition to Professor C. L. Fortescue who may also be associated with Mr. Fleming in the subject of technical education. With them in this aspect, we should certainly class Mr. F. W. Crawter, who has devoted so much attention to the younger entrants to the profession. Mr. E. S. Byng places himself by his recent paper on the engineer-administrator, and Mr. P. Good represents the trend towards high but practicable standards in engineering.

Resuscitation from Shock

A NEW H.O. Order requires the display of instructions for the treatment of persons suffering from electric shock in factories and workshops where electricity is generated, transformed or used at pressures above 250V d.c. or 125V a.c. This is a modification of Regulation 29, which has hitherto applied only to premises where voltages do not exceed 250, whether d.c. or a.c. In so many others of the H.O. Regulations, 125V a.c. is equated in effect with 250V d.c., that it is quite logical that the implications of this should be recognised, as they are under the Order. The important thing to remember is that many persons, apparently dead, have been revived after as much as two hours of artificial respiration of the type prescribed in the ELECTRICAL REVIEW instruction cards.

THE NATIONAL ELECTRICAL CONVENTION



Reports from our Convention representatives

BOURNEMOUTH, SUNDAY.

IT was a great change to come from the Cimmerian gloom of London on Saturday to the bright sunshine of Bournemouth. The electrical note is struck as soon as one leaves the Central railway station by the A.A. direction signs.

The President of the Convention, Mr. E. E. Hoadley, had already arrived at the Hotel Burlington, the headquarters, and was looking fit and eager to meet the high responsibilities facing him during the coming week. He has certainly succeeded in imbuing others with his own faith that the present opportunity must and will be taken to translate into practical terms that co-operation within our industry which has hitherto generally been envisaged only as an ideal. The feeling abroad is quite obviously one to engender the atmosphere needed for a sincere attempt to achieve the end we all have in view.

I have just seen an article contributed to a Sunday newspaper which lays upon this Convention the duty of solving the whole problem of distribution; otherwise, the writer says, the supply industry will be nationalised. While delegates hope there may be improvements in the present position as an indirect result of happenings here they realise that the success of the Convention is not to be measured by an ability to clear up immediately the debris that has taken fifty-odd years to accumulate, and that its object is not to draft a scheme for the "rationalisation" of distribution.

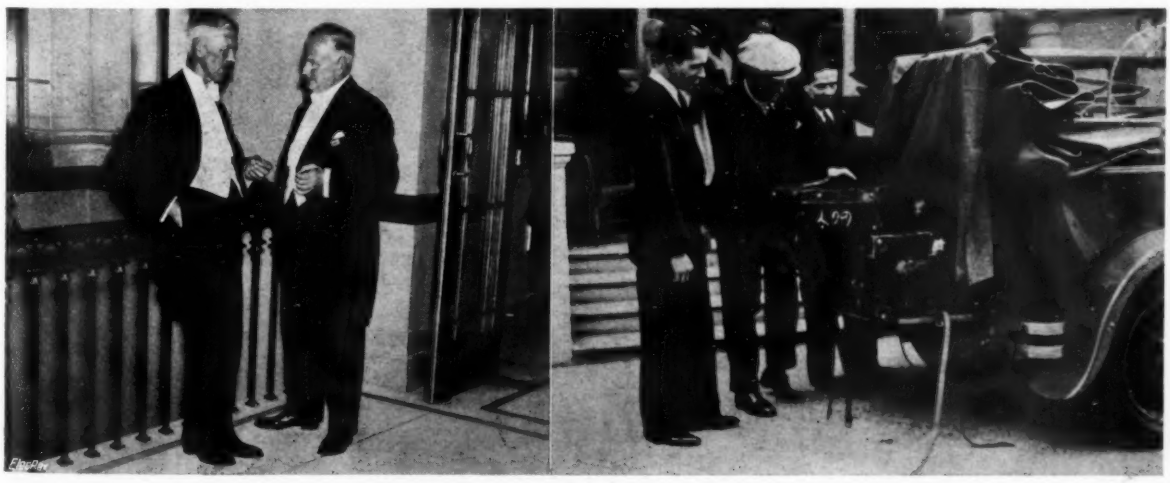
Among other early arrivals were Mr. P. J. Robinson, last year's I.M.E.A. president, lending his weight to the occasion, Sir Percival Bower, the E.D.A. president, and Mr. J. W. Simpson, the general secretary of the Convention.

The final number of delegates, Mr. Simpson tells me, is 2,500, which is just about double the corrected figure for the I.M.E.A. Convention at Liverpool last year. The difference between the two is probably not so great as might appear from these figures, as many visitors, such as those primarily concerned with the exhibition, have not on previous occasions been included in the official lists.

An analysis of the list of delegates attending the Convention shows that the representatives of the I.M.E.A. number 615 while the E.C.A. is responsible for 213, and B.E.A.M.A. for 170. The Incorporated Association of Electric Power Companies accounts for 25, the Provincial Electric Supply Association for 42, the London Electricity Supply Association for 22, the Conference of Joint Electricity Authorities, &c., for 23, the Electrical Wholesalers' Federation for 14, E.L.M.A. for 15, and the C.M.A. for 11. There are about 880 visitors most of whom are ladies.

Mr. and Mrs. Hoadley try the electric invalid carriages with Mr. J. W. Simpson as a spectator

Travelling along Christchurch Road from Boscombe to the Central Square in Bournemouth in the dusk, one becomes conscious suddenly of a greatly increased road visibility, and hence ease in driving, that seems out of all proportion to any increase in the brilliance of illumination. This provides a measure of the difference between gas lighting and electric-

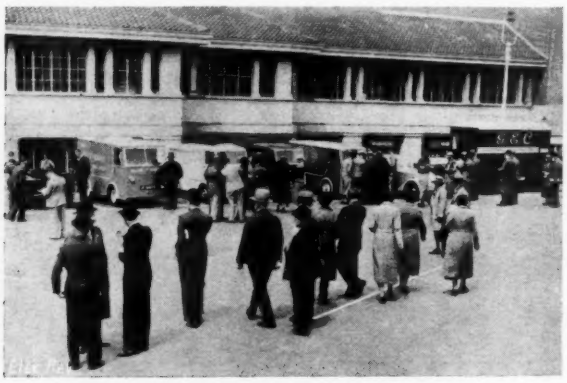


Left: Messrs. J. C. Brydges and C. Hubert Smith. Right: Mr. F. W. Purse arrives.

discharge lamps as here represented by the B.T.H. "Mazda-Mercra" lamps—and in the term "lamps," their lanterns must be included. The same sense of safe driving is also experienced on Richmond Hill, where 150-W Philips "Philora" lamps 25 ft. high are spaced 120 ft. apart in the "Solux" fittings of the Wardle Engineering Co., and in several streets lighted by G.E.C. "Osira" and Siemens "Sieray" lamps. On all sides pedestrians can be heard referring to the discharge lamps as the "new lighting" without critical reference to the colour, which they now seem much more ready to accept than formerly.

In the centre of the town, one has an uncanny feeling of being taken back in time to the Jubilee illuminations. This view appeared to be shared generally by the townsfolk and visitors, as, undeterred by the rain which began to fall shortly after dusk had set in on Saturday, they wandered through the gardens with locally illuminated flower beds and floodlighted bosky alcoves. And how suitable is the colour of the mercury discharge lamp for bringing out the vivid green of the turf! Some of the more exotic shrubs may look a trifle theatrical in the artificial light, yet to see them looking like that in sunnier climes many English people travel hundreds of miles.

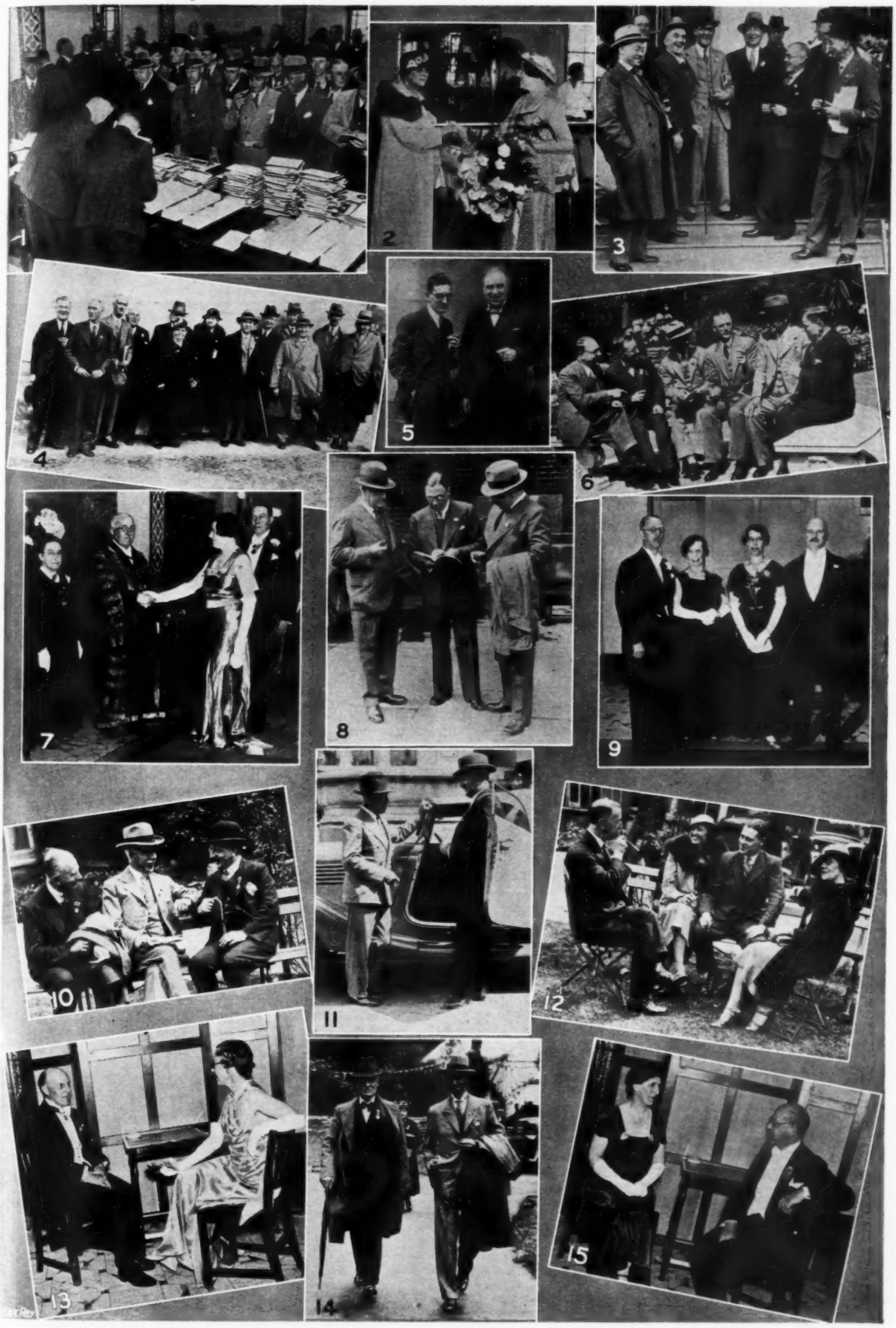
Mr. and Mrs. A. Brammer assist the E.I.B.A. funds. Right: Delegates in the garden of the Burlington Hotel



The electric vehicle parade

The President and Mrs. Hoadley greet Mr. and Mrs. W. R. Rawlings

Mr. Hoadley delivers his presidential address



Some Well-known Personalities at Bournemouth

1. Delegates "signing on." 2. Mrs. Hoadley welcomes Mrs. Snow Huddleston to her tea party. 3. Messrs. J. R. Loosemore, C. Pipkin, T. B. Feltham, Councillor J. Marland, J. W. Mayall, and E. J. Jennings. 4. A group of E.C.A. members. 5. Dr. Ritchie and Mr. John Christie. 6. An informal conference—Councillor L. Myers, Mr. A. J. Newman, Mr. A. G. O'Neill, Mr. R. Lee, Councillor J. Morton, and Ald. T. Evans. 7. The Mayor and Mayoress greet the President and Mrs. Hoadley. 8. Messrs. K. W. MacNee, J. C. Watson, and H. Wilson. 9. Mr. and Mrs. J. W. Simpson and Mr. and Mrs. E. Seddon. 10. Messrs. H. E. Annett, H. R. Burnett, and S. E. Britton. 11. Aldermen S. C. Thompson and C. Kingston. 12. Mr. T. E. Ritchie, Miss V. Holt, Mr. R. Austin, and Miss H. Savage. 13. Sir John and Lady Brooke. 14. Messrs. W. C. P. Tapper and C. G. Morley New. 15. Mr. and Mrs. T. E. Alger.

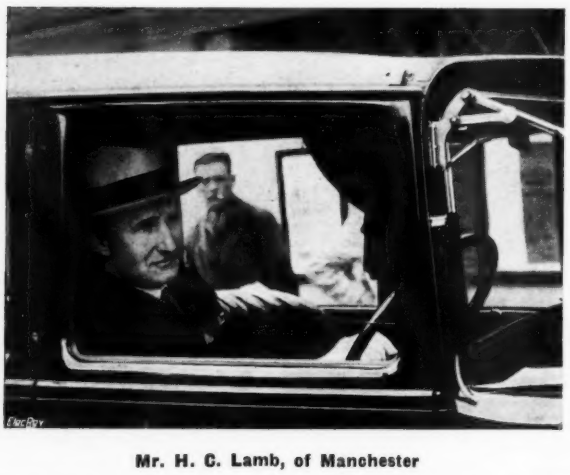
All this was backed by the west side of the Pavilion decorated in red, white and blue by the G.E.C. "Osira" floodlighting, repeated in red and green on the south front making it a definite centre of attraction.

From the west terrace of the Pavilion can be seen the back

Messrs. G. Porter and A. Chambers enjoy after-lunch cigars

of the Exeter Hotel flanked by the White Hermitage. The former is illuminated on all sides (the other side being observable from the exhibition grounds in the Winter Garden) by Edison Swan floodlights in "Sirius H" lanterns giving a wide flat beam for a high building with small projection. The arc of the "Escura" lamp is maintained centrally by the magnetic field of the choke beneath the lantern.

On the higher ground behind the Pavilion is the Royal



Mr. H. C. Lamb, of Manchester

Bath Hotel floodlighted in mauve by means of B.T.H. "Mazda-Mercra" equipment and forming an effective contrast with the white spire of St. Peter's Church which appears above the tops of the neighbouring buildings.

MONDAY.

THERE was a remarkably large attendance for "badging" when the Convention office opened at 10 a.m. to-day. In the interests of the Electrical Industries Benevolent Association, Mr. E. E. Sharp, its executive chairman, had organised a cohort (or perhaps "bevy" would be the more appropriate word) of ladies to present emblems to the arriving delegates in exchange for donations with which to carry on the good work.

A walk through one of the principal streets of the town has revealed many electrical side-shows, mostly representing the surplus energy of manufacturers who are exhibiting at the Winter Gardens. Messrs. J. Beale have most conspicuously entered into the spirit of the occasion, as in addition to allocating window space to Ediswan lamps, Ferranti fires, and ranges of domestic appliances by Hotpoint and L. G. Hawkins & Co., they have devoted one floor to a well-arranged exhibition in which the following firms, in addition to those named, are displaying a good selection of their products:—Berry's Electric, Ltd., B.T.H., British Vacuum Cleaner Co., Crompton & Kye Lamps, Edison Swan, English Electric Co.,

Lighting at Richmond Hill, Bournemouth, by Philips' "Philora" lamps in Wardle "Solux" directional units

Furn-Art, Hague & McKenzie, H. M. V. Household Appliances, Met-Vick ("Cosmos" lamps), Nico Light Co., Pressed Steel Co., Simplex Co., and Thermega, Ltd.

The Electrical Association for Women has also a stand; this was not quite complete at the time of our visit, but a selection of Crabtree switches was one of its features. The exhibition will be closed to the public on Friday, when it is to be handed over to the E.A.W. Beale's premises is only a minute's walk from the attractive modernistic building forming the new showrooms of the Bournemouth & Poole Supply Co. (described in our last issue). On the way one passes the windows of Messrs. Aish & Co., the contractors, where "Magnet," Hotpoint, and Frigidaire apparatus is attractively displayed. Opposite, the Pressed Steel Co. has opened a temporary showroom for its refrigerators.

The Hotpoint Co. has secured another good pitch at the Westover Garage opposite the Pavilion; so has the Hurley Machine Co. (next to Bobby's), which is showing various types of washing machines, including the general service kind, which includes the provision of music by means of the radio receiving set incorporated within its frame. Other special window displays bearing the electrical stamp that I passed include those of Messrs. Bacon & Curtis, and J. J. Allen, Ltd.

During the morning an effective showing was made by the Electric Vehicle Committee of Great Britain, Ltd., in the

Left: Sir Archibald Page at the reception by the Mayor and Mayoress. Centre: The E.L.M.A. stand. Right: Mr. Snow Huddleston working for the E.I.B.A.

Pavilion car park of nine battery cars ranging in size from the 30-cwt. van (driven by a 320-Ah Kathanode battery) provided by the D.P. Battery Co. for the G.E.C. and Carter, Paterson, to the four-speed bath chairs of Auto-Electric Cars & Trucks (Nelco, Ltd.). In two of these the President and Mrs. Hoadley were photographed, a voice from the crowd suggesting that they wouldn't be required for their occupants for another sixty years! Nelco also had two 10-15-cwt. chassis. Electricars, Ltd., had the 8-cwt. van of the Leyton public lighting department on view, for which 30 to 40 miles per charge is claimed. The Metropolitan-Vickers Electrical Co. is prepared to guarantee the running cost of the three-wheel 10-12-cwt. dairy and bakers' vans sold by P. W. Taylor. The five vehicles exhibited by G. E. Morrison & Sons comprise a three-wheel 6-cwt. chassis with a range of seventy-five miles at a maximum speed of 30 m.p.h., and four 10-12-cwt. chassis and vans, one of which was fitted with an attractive stream-line body, for Sunderland Corporation Electricity Department.

Messrs. Partridge, Wilson & Co. give the cost of running their 8-cwt. van as 6d. for forty miles; three of these were to be seen, including the stream-line West Ham model. Two 15-cwt. chassis were also shown by this company, the van body of one of them bearing the slogan "Use Electricity—this does," but the model that appeared to attract most interest was the neat town coupé with a range of thirty-three to forty miles and a cruising speed of 27 m.p.h. How many years will it be before all the cars that bear the distinguishing badge "N.E.C." (supplied by the A.A.) are electrically propelled?

The Horticultural Section and marquee at the exhibition

TUESDAY.

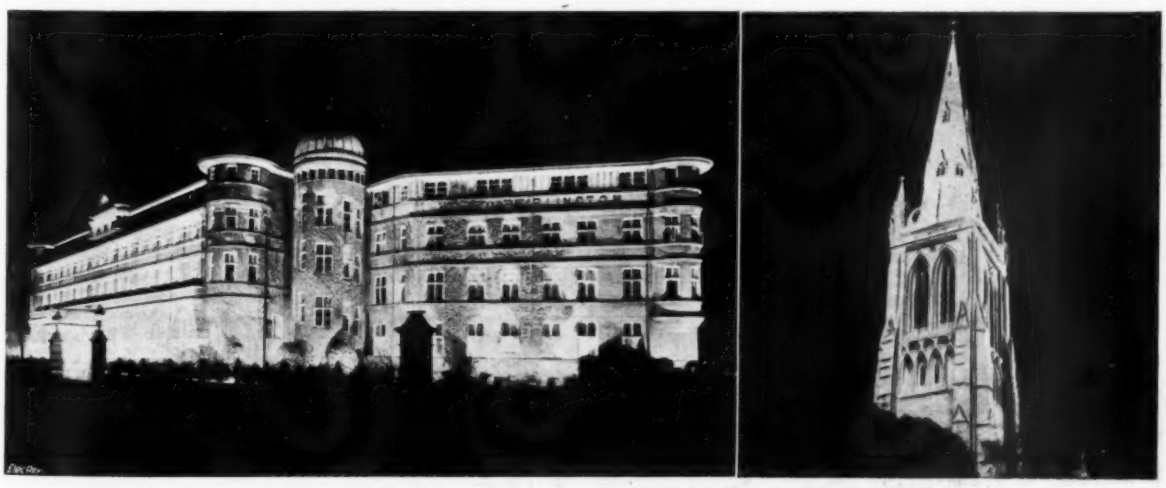
THE presidential reception last night was numerically a big affair. During the dance at the Pavilion, which terminated at 1 a.m., numerous opportunities were taken to view the floodlighting of the town from this vantage point.

The weather continues to be somewhat chilly; even our hardy North Country friends, who had expected to find a land where it is always afternoon, think it so.

At the opening session this morning the Mayor of Bournemouth referred ruefully to the town's slogan: "Where winter summers," and, less regretfully, to its motto, which in the vernacular means "Health and Beauty." Probably 100 per cent. of the visitors will find the first and nearly 50 per cent. will retain the second. There has been little time in which to adopt his suggestion of seeing Bournemouth or of taking advantage of his invitation to ride on the tramcars and trolley buses, go on the pier, attend concerts and play tennis and bowls—all as the guests of the Corporation.

Inspecting the horticultural display

After the civic welcome Mr. Hoadley read a telegram which had been sent to the King, to which a reply was received a little later.



Some Bournemouth floodlighting: Burlington Hotel (B.T.H.) and St. Peter's Church (G.E.C.).

The presidential address was well calculated to promote a desire to do something about improving some of " the common things " that are the daily concern of his hearers. Listening to the rumblings of appreciation, rising to outbursts of applause, that ran through the hall from time to time, one could detect the topics that made the greatest appeal.

Mr. H. Marryat proposed a vote of thanks to the President for the excellent manner in which he had conducted his opening meeting; the presidential address was fully worthy of the occasion. He thought that the conclusions to be reached this week would carry far more weight than any previous discussions.

Mr. S. B. Osler (chairman of the Committee) mentioned that the German Post Office employed 1,800 battery vans for mail delivery and said that investigations had showed that we were behind other countries in this respect. The import of 1,100 million gallons of petrol each year into Great Britain meant less work for our collieries. Battery charging would become a valuable night load.

Wednesday morning's platform

The meeting terminated rather early, and later the official opening of the exhibition was performed by the Mayor at the Winter Gardens. A marquee has been erected which provides a 60 per cent. increase in the available space, while the Winter Garden has been decorated in a manner to render it more suitable than hitherto for the accommodation of the electrical display. Also, facing the main entrance has been provided a rest lounge which is a welcome innovation, for at the I.M.E.A. Conventions in previous years the exhibition has been rather restricted and overcrowded.

At the lunch given by the Electric Vehicle Committee of Great Britain, held at the Royal Exeter Hotel, the President referred to his service as hon. secretary to the committee from 1913 (when he succeeded Mr. Frank Ayton) to 1926. He attributed the lack of progress in the past to putting the battery vehicle to uses for which it was unsuitable and to " garden-roller engineering " in the heavy designs of chassis.

They were now things of the past. He had been driving about the town in an electric coupé which would do more than thirty-five miles on one charge at 30 m.p.h., but up to seventy miles could be covered per charge with a little higher initial expenditure on accumulators. The electric vehicle had a special field in the delivery of perishable and easily contaminated goods and where stops were frequent and distances short.

Within a few years, he prophesied, battery-changing stations would be found at frequent intervals and these would extend the working range of the vehicle. (This use of the expression " battery-changing " rather than " battery-charging " seemed to me significant and to be commended.)

The fleet of electric vehicles on exhibition yesterday was waiting outside the hotel for demonstration. Their acceleration—a factor of the first importance under modern traffic conditions—seemed remarkably good, though it was asked whether their silence in running and absence of fuss might not add a new danger to pedestrians!

WEDNESDAY.

THIS morning delegates turned up in full force to listen to the speeches of seven leaders of the industry, Sir Archibald Page, Mr. P. J. Robinson, Mr. J. C. Dalton, Mr. H. Marryat, Sir Felix Pole, Sir William Ray and Sir John Brooke—surely one of the strongest electrical " platforms " which has yet been assembled.

At the conclusion of the speeches Mr. Hoadley proposed a vote of thanks, which was carried with acclamation.

Before adjourning the meeting, Mr. Hoadley referred to the death of Mr. D. N. Dunlop, Director of B.E.A.M.A., and asked the delegates to stand for a few moments in silence as a tribute to his memory.

In spite of the mixed weather the E.C.A. garden party at " Cuffnells," Lyndhurst, attracted a large crowd on Wednesday afternoon. As we mentioned last week, " Cuffnells " was the home of the late Mrs. Hargreaves, the original of Lewis Carroll's " Alice."

Some of the 2,000 guests at the President's reception

Each guest received a souvenir booklet in the preparation of which no little ingenuity is displayed. A brief history of " Cuffnells " runs through it, and here and there are very clever electrical parodies of the verses included in " Alice in Wonderland " and " Through the Looking Glass," with illustrations after Tenniel.

The delegates are looking forward to the two papers which are to be read to-morrow (Thursday), and are also hoping that the weather will permit them to see a little more of the attractions of the Bournemouth district before they return to the daily grind.

The Presidential Address. By E. E. Hoadley

Delivered at the Tuesday morning session

IN the course of his address, the President of the Convention said that standardisation of voltage is one of the most pressing problems before the industry. What sound reasons can be advanced to excuse there being no fewer than fourteen public supply voltages in use in this country between 200/250 V? Surely an industry which can pay a charge of £19,000,000 for the standardisation of frequency which, after all, does not touch the whole of the supply in this country, but only the a.c. part of it, could at least afford another fifteen to eighteen millions which is the estimated cost of changing over to the standard 230 V.

During the past year the I.M.E.A., by negotiation with the Electric Lamp Manufacturers' Association, had arranged for putting on the market on June 1st, 1935, a lamp made by the associated manufacturers to be sold to the public at 1s. This is an achievement worth while, and if only standardisation of voltage could be brought about, there would very likely be, when that time comes, an arrangement to put on the market a 6d. lamp.

[*Sweatman, Hedgeland & Dunk, Ltd., Maidstone*

Mr. E. E. Hoadley, President of the Convention

It is much too Utopian to hope for a standard charge, at any rate for some time to come, but it is highly necessary that a standard method of charge should be evolved, at least applying to domestic consumers. Agreement should be sought as quickly as possible on a standardised two-part tariff for domestic users.

Some of us in our pursuit of equity have rather overlooked expediency. A two-part tariff can be made simple and it certainly is equitable, while a flat rate charge for lighting should, for many reasons, be kept up to a fairly high level. Lighting alone in many cases is not very profitable, and it is only by the offer of low rates for the other services that the desired business will be obtained. A house "wired for electric light" provides a market worth about £3 per year, leaving to our gas friends a market worth anything from £8 to £12 per annum.

At present it cannot be expected that the unit charge should be standardised over the whole of the country, but it might be done by supply authorities by amalgamation or by other methods, by which large areas could be considered as a whole.

Standardisation of Apparatus

One of the most pressing problems at the present day is the very vexed question of plugs or socket outlets. There is a way, and quite a simple way, of obtaining what everyone requires, but for reasons connected with patents and other matters it has not been found possible to adopt it. It should be possible for a consumer to go to any electrical contractor's establishment or large stores and buy a kettle or other piece of domestic electrical apparatus and be sure that when she gets home the plug will fit into the sockets which she has had installed in her house.

This does not seem too much to ask of an industry composed of scientists and engineers, without taking into account the business men, but in spite of this the problem is still unsolved. Non-kinkable, easily cleaned, durable and presentable flexible cables are now obtainable.

Equally important as these two items is the adaptor. Means should be sought whereby the use of one standard socket outlet and plug, one standard kind of flexible, made perhaps in two sizes, and one standard adaptor should be made compulsory. Sooner or later such an innovation will come about and the least costly method will be to do it as soon as ever possible. The standardisation required by the public does not require lengthy B.S. Specifications.

Unsafe Appliances

One thing must not be lost sight of, and that is the safety of the public. It is perfectly possible to produce apparatus that is safe in use at a reasonable price. Unfortunately, however, during the past few years certain apparatus has been introduced into this country which is definitely unsafe. The Electrical Apparatus Committee of the I.M.E.A. has had before it samples of electric fires, socket outlets, and other pieces of apparatus which are absolute death traps. This apparatus was not of British manufacture; it was purchased at branches of some of the well-known multiple stores.

The I.M.E.A. has taken all possible steps to prevent the use of such apparatus, all supply engineers have been circularised, the British electrical manufacturers have been advised, the Electricity Commissioners have discussed the matter with the I.M.E.A., and the various multiple stores have been written to.

But all this is only playing with the problem. What is very urgently wanted is that legislation shall be enacted to make illegal the sale of such apparatus, for it is only by stopping its sale that its use can be prevented. There is a large amount of agreement that some steps should be taken at once. Something in the nature of a National Proving House, only concerned with the safety side of domestic electrical apparatus, should be set up.

Much is being done to cheapen generation, but this only concerns the wholesale side of it. Equally energetic efforts should be made to cheapen the retail side of the business. The use of standardised apparatus such as feeder pillars, distribution pillars, cut-outs, &c., will do something. Still more can be done by the use of boosters and balancers enabling full use to be made of the copper that is already laid, thus bringing about the advantage that the heating of cables shall be the limiting factor of what they will carry rather than, as at present in most cases, the pressure drop limiting the possible load.

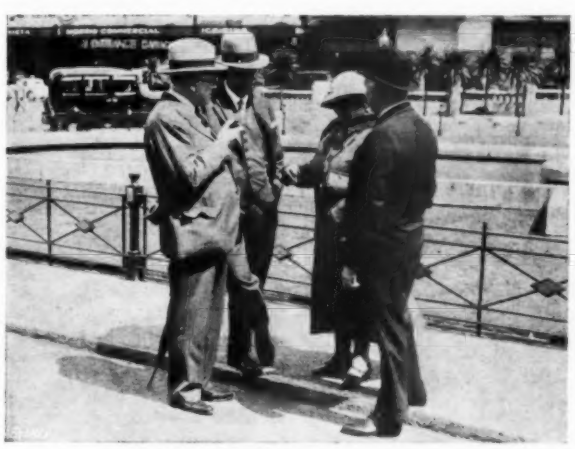
A National Council

Action should be taken at once. A National Co-operation Committee or National Council should be set up, to include representatives of all the Associations taking part in the National Convention. This body would not in any way encroach upon the work of the Institution of Electrical Engineers, which is concerned with scientific matters, while this Council would be concerned with industrial and trade matters.

Mr. Hoadley believes very strongly that in the near future companies and municipalities will be working together a great deal more closely than they have done hitherto, as in his own area (Maidstone).

It is a very disturbing fact that during the past few years a number of the leading engineers of municipal supply undertakings have resigned to take up other appointments; the reason was certainly not because they were too well paid in their municipal jobs. Mr. Hoadley strongly commends to the municipal delegates the equity and advantage of payment by results. He is also in favour of arrangements whereby all those who work within the industry should share in its prosperity, from the highest to the lowest, whether by bonus or otherwise. At least one municipal undertaking is now giving the whole of its staff a "prosperity" bonus in addition to their usual wage. Salaries of engineers and managers of electricity undertakings should not be regulated by the salaries paid to other municipal officials.

He appeals to the manufacturers for their assistance in the cheapening of domestic electrical apparatus by simplification of design and standardisation of parts.



A group of delegates to the Bournemouth Convention. From left to right: Mr. P. H. Symonds (English Electric Co.), Mr. C. S. Davidson (Barnes), and Mr. and Mrs. P. E. Ryeroft (Great Yarmouth)

A Symposium of Views

Speeches by representatives of all sections

PROBABLY the most important session of the Conference was held on Wednesday morning, when leaders of the various branches of the electricity industry expressed their views of the situation and made suggestions for bringing about improvement.

The Central Electricity Board

The first speaker was Sir Archibald Page, chairman of the Central Electricity Board, who, after relating how the reorganisation of the generation and transmission of the industry had paved the way for bigger development, called for a greater effort from all sections.

He said that the aim of the industry now must be to achieve both in cost and in service everywhere what had already been achieved by the best of our undertakings. The supply industry itself must devote more individual and collective thought to the subject of distribution areas, not making size the only criterion but having regard also to the proper balancing of the territory and keeping well in view the immediate lessening of the average cost that could be achieved by the amalgamation under enlightened management of some of the undertakings.

The work of the Electrical Development Association must be as much directed to the creation of enlightened policy within the industry as it was to education of the public on the incomparable service that electricity could afford as an agency of light, heat and power. The industry could not escape from the public duty that rested upon it to co-operate in making available to the public a universal supply of its commodity on a basis as free from complication and unnecessary differences as was possible.

Dealing with preparations for the future, Sir Archibald said that in less than two years, therefore, arrangements had been made for generating plant extensions representing orders to a total value approaching £14¾ millions.

The I.M.E.A.

Mr. P. J. Robinson, city electrical engineer, Liverpool, was highly critical of some of his brother engineers and managers. He said that the deplorable lethargy which was exhibited in some undertakings was almost unbelievable. The engineer or manager of the concern should be made to realise his responsibility for progress or be superseded. A general reduction in the cost of electricity to the consumer depended largely on increasing the total output of electricity, and this increase could only come about by intensive development.

There was a quite unnecessary variation in the price of electricity charged to consumers in different parts of the country, very often in adjacent areas, and if this state of affairs persisted it could only result in the strangulation of the progress of which the industry was capable.

One of the most satisfactory means of increasing domestic load consumption was the adoption of an attractive system of hire with maintenance of domestic apparatus. If an earnest endeavour were made to standardise apparatus there would be a reduction in the manufacturing costs which would benefit the consumers and manufacturers.

The Power Companies

Mr. J. C. Dalton, of the County of London Electric Supply Co., said he welcomed the Convention as a means of demonstrating the common aims and interests of the companies and municipalities. He trusted that the domestic load would not be regarded as the be-all and end-all of the supply industry's aim. The demand for power exceeded the combined demand for all other purposes, and therefore power was the vital concern of everyone connected with the industry.

During the past period of industrial depression suppliers of electricity could not deprive industrial users of such a necessity. Therefore in those times the suppliers had to scale down their charges. Now, he was happy to state, the slump was over, and that being so users and suppliers must once again become partners in recovery as they had been partners in depression.

Three-quarters of the population of this country was engaged in industry, and electricity was being employed in four-fifths of the industry. The suggestion therefore was that everyone in the industry should assume the mission of preaching the conversion of the ten million h.p. of industrial power plant which remained to be changed over to electricity.

They had heard a good deal lately about "chaos" in the industry. A good deal of nonsense had been talked and there had also on occasion been threats from one direction or another as to what the various sections of the industry might be compelled to do or not to do if they did not very soon set about "putting their own houses in order." To those sort of threats the reply was that everyone in the industry should make himself become so fully occupied with the development of his business, and so well informed about its present state and future conduct, that no one would dare to jeopardise it.

The E.C.A.

Mr. H. Marryat, president of the E.C.A., said that electrical contractors saw the course of events in every direction converging to make electric service more attractive than ever. But now, in view of the growth and ramification of the industry, and the fact that our final and biggest problems were being tackled seriously, it seemed necessary that the industry should have its own trade parliament with a properly paid executive to administer agreements and form a court of appeal to settle misunderstandings.

Apart from this central co-ordinating body, the Contractors' Association visualised a development programme based upon the existing supply areas and providing for: (1) The appointment of a development officer by the supply authority in each large area; (2) monthly meetings of a properly constituted "Electric Circle"; and (3) particular campaigns—cookers, water-heaters and so on.

The thing to do was to "paint the town red" from time to time by a lavish and widely scattered display of similar posters driving home the same idea; and such organised publicity as this could be achieved only by establishing the closest possible link between the supply authority and every local "point of public contact."

The Manufacturers

Sir Felix Pole, representing the manufacturers, contended that the manufacturing industry had not received its due reward for the research work it had done and the technical advance it had made. Half of the twelve larger manufacturers had not paid a dividend on their ordinary shares for several years, while in other cases dividends had been quite small.

Contracts had been accepted in the last few years at less than factory cost; this was not good for the industry. Competition had resulted in unnecessary additions to productive capacity and in large losses of capital and had tended to reduce research and development and even to impair efficiency.

If one result of the Convention was to bring home the fact that the British manufacturers of electrical apparatus were outstanding in their scientific achievements and were entitled to be paid adequately for their appliances, then at least one sound conclusion would have been reached.

The E.D.A.

Sir William Ray, speaking on the value of a central publicity organisation like the Electrical Development Association, of which he is executive chairman, said that most of the large industries serving the public now realised the importance of national publicity directed to educating the people to a full appreciation of the value and advantages of their service. In the case of electricity there was the additional benefit that the increase in the use of the service and the extension of its applications were a means of reducing cost.

The fact that we had proved the feasibility of supplying electricity on an economic basis for cooking and heating as well as lighting in working-class houses indicated that every house, large or small, could be visualised as an all-electric proposition. Several of the special E.D.A. Committees were engaged in studying the commercial and technical problems involved in the exploitation of this wide field.

In industrial power, lighting and heating there was still as much room for further business as in the domestic sphere.

Other directions for expansion were water pumping in rural areas, street lighting, trolley-bus operation, and battery traction.

The Electricity Commissioners

Sir John Brooke, vice-chairman of the Electricity Commission, urged supply undertakings to adopt for domestic supplies the two-part tariff based on the area of the house. He stressed, however, that uniformity in methods of charge was not uniformity in charge itself. It was the ideal of some that actual charges should be the same throughout the country, and that the price charged to any individual should not bear relation to the particular cost of affording the service. The Commissioners did not consider that a practical ideal at present.

In fixing tariffs undertakings should consider the future and make allowance for the growth that the reduction in cost would bring. The one test for methods, tariffs and organisation should be whether they would be the best possible when the demand for electricity had doubled, as it was certain to do.

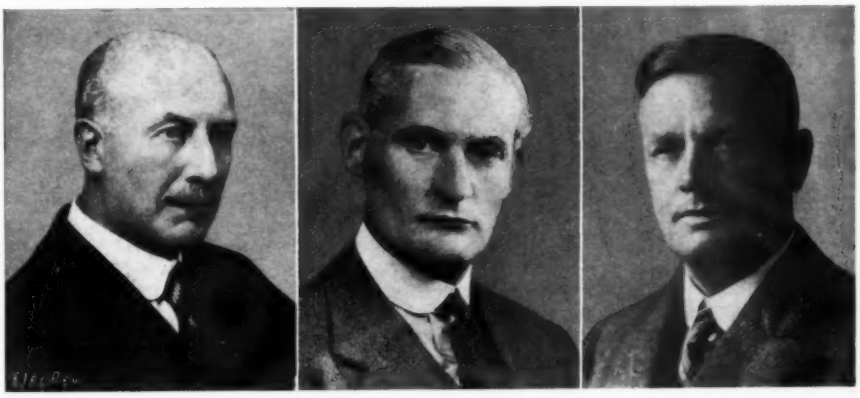
Industrial Power Supply

Paper presented at the Thursday morning session

THIS joint paper by Messrs. F. Forrest (city electrical engineer, Birmingham, representing the I.M.E.A.), H. Hobson (general manager, Central Electricity Board), and C. D. Taite (Lancashire Electric Power Co., representing the Association of E.P. Companies), examines the dependence of Great Britain upon her manufacturing industries, and the extent of the mechanical and electrical applications of power therein.

With the aid of tabulated statistics and graphical records the authors show that the percentage of the occupied population engaged in manufacture is appreciably higher in Great Britain than in the U.S.A., France, or Germany. The amount of national income derived from the various types of occupation shows still more clearly the predominant importance of industry in the economic structure of Great Britain.

Dependence on industry connotes predominant interest in power supply, but the authors show that there is a relative deficiency in the total power equipment of industry in Great Britain as compared with her principal competitors. The average standard h.p. of equipment per worker in the U.S.A. is nearly twice that in Great Britain, the deficiency being almost entirely in electrically applied power.



Messrs. C. D. Taite, H. Hobson and F. Forrest (*Photos by Lafayette*)

While, owing to the differing characteristics of the industries in the two countries, the American scale of power utilisation is probably not required in Great Britain, there is obviously scope for a very considerable increase in the power equipment of industry in this country. An increase to an average of, say, four electrically applied horse-power per operative would mean, on the 1930 level of employment of workers, an addition of no less than 12½ million h.p. to the country's total capacity of electric motors. This is by no means impossible. Indeed, when it is remembered that the electrically applied horse-power per operative increased by nearly 50 per cent. between 1924 and 1930, it would not seem over optimistic to envisage the attainment of that level by 1950.

The total horse-power available advanced from under 1¼ h.p. per wage-earner in 1907 to 2.81 per operative in 1930. The power equipment per worker almost doubled between 1907 and 1930. The changes in the method of utilisation of power are also instructive. At the 1907 Census mechanical power directly used represented 86 per cent. of the total; by 1930 the figure had fallen to 38 per cent. In 1907 nearly 78 per cent. of the total power requirements was furnished by reciprocating steam engines used directly; in 1930 the corresponding figure was 32 per cent. A total of 5½ million h.p. of reciprocating steam engines still survives in the industrial power equipment of Great Britain, and here at least there is a large field for rapid conversion.

In 1907 public electricity supply provided the energy for less than 6 per cent. of the total power equipment of industry, whereas by 1924 the figure had risen to 28 per cent. and by 1930 to 35 per cent.

Advantages of Public Supply

Public supplies of electricity are the cheapest and most satisfactory source of power, because the use of large units of generating plant reduces the capital cost per kW of capacity and public suppliers can raise capital in the most favourable market.

The general case for associating much higher overall efficiencies with the large generating stations is beyond question. Public supplies offer greater security, as adequate reserve is available. During periods when full factory output is not required the efficiency of private generating plant is lowered.

During 1931 and 1932, while industrial production in this country fell to 95.7 and 95.3 per cent. of the 1930 level, and in consequence most private generation fell also, the total output of public generating stations in Great Britain rose to 104.5 and 112 per cent. of that recorded in 1930.

The size of private plant cannot be maintained accurately proportional to the power requirements at all times. Also the diversity experienced by public systems reduces the fixed costs of production per kWh sold, and their continual extension enables them to take advantage of every technical advance.

During the 1920-34 period the average fuel consumption per kWh generated at all public generating stations in Great Britain decreased from 3.32 lb. of coal to 1.58 lb. Taking the 1922 price to be 100, the average price of coal has dropped to 75 and the average price per kWh (power) has dropped to 59.

The Grid's Effects

The foregoing factors making for economy will be accelerated by the national co-ordinating and inter-linking grid scheme. The rapidity with which these increased economies can be realised must depend largely upon the growth of the output of the public supply undertakings throughout the country. Thus every new industrial supply taken through public mains will contribute directly towards the reduction of public supply prices. The grid will also help to decentralise industry, making power available in rural areas where rating assessments are lower and sites are cheaper.

If rapid expansion of public supply with its corollary of lower prices is to be achieved, mere reliance upon the conversion of obsolescent industrial plant is inadequate.

Taking Over Private Plant

To overcome the difficulty represented by the outstanding debt upon such existing private plant, one possible method (which is receiving increasing attention) is for the supply authority to enter into an arrangement with the industrial private plant owner, whereby the former takes over the responsibility for the operation of the private plant during the remainder of its useful life, refunding to the owner such annual sums as will enable the outstanding debt upon the plant to be amortised. Private plant of relatively large size thus coming under the control of the public supply authority can either be kept as standby or operated in parallel for peak load purposes. During the greater part of the year, however, the plant can be shut down and the necessary supply given from the public system at the low cost associated with off-peak operation.

Until recently it has been held by many that certain industries which require for their processes large quantities of steam as well as power could not economically be supplied with their power requirements by public supply authorities. Recent careful investigations have made it clear that, when full weight is given to the usually heavy capital investment required for special back-pressure or pass-out turbines with their complex control mechanism and the frequent non-coincidence of the steam and power demands, the balance of advantage on power cost is by no means always with the private plant. Indeed, unless the ratio of steam to power requirements is abnormally high, public supply authorities can supply electricity at competitive prices, more particularly when the load factor is high.

Industries producing waste heat or gas are in a somewhat different category. It can often be shown that it is more economical for the owner of such a works to reorganise his process so as to eliminate waste heat rather than to utilise it for power production. Surplus gas, such as is necessarily produced in the pig iron industry for instance, can often be profitably employed in the later heat processes incidental to the manufacture of steel, and here again the modern tendency

where open hearth methods are adopted is towards the purchase of electric power from the public supply authorities.

Supplies to such special industries, being usually large and having a high load factor, present many advantages to a supply authority, some of which are difficult to assess by ordinary costing methods. Experience has, however, demonstrated the wisdom of the adoption of special tariffs in such cases, so designed as to give full weight to the circumstances.

The negotiation of contracts for the public supply of electricity to large power users is a complex task. As an appendix to the paper the authors provide a schedule setting out a detailed form of cost analysis, with accompanying explanatory notes, which provides for the inclusion of all the relevant items of cost.

Domestic Electrical Development

Presented at the Thursday afternoon session

THIS paper is divided into three parts. The first is by Miss C. Haslett, C.B.E., representing the Electrical Association for Women, who expresses the view that women and the general public are ready for intensive electrical development.

The need is not so much for propaganda to encourage the use of electricity as for the provision of service. The most urgent needs are for a low and uniform domestic tariff, unified assisted wiring schemes for all domestic purposes, and cheaper apparatus. A great campaign is needed to bring the level of all those supplying electricity up to the standard of those who are already giving cheap and efficient service. It is the consumer's and not the engineer's point of view that matters.

Development in the past has been, in some ways, too rapid for careful planning, and progress has not been evenly maintained in all directions. If the houses now being built are electrically equipped the danger of degeneration and relapse into slum conditions, which certainly threatens a portion at least of the new houses proposed, will be very considerably lessened. The "electrical revolution" is a means of atoning in part for the mistakes of the past by helping to relieve the conditions created by the "industrial revolution" in manufacturing towns.

The heart of our social system is the home, and therefore domestic electrification must claim the greater share of our attention. The ideal should be approached by promoting education and instilling confidence, especially in children. Miss Haslett outlines how the E.A.W. is helping to make articulate the interest of school authorities and teachers, stating that there is scope for inquiry, advice and assistance in properly equipping domestic science departments with electrical appliances. This kind of work needs to be greatly expanded.

Another aspect of the problem is that not nearly enough stress has been laid on the importance of training people who have to operate, not their own, but other people's apparatus. Miss Haslett states that the domestic servant of the future will have to provide evidence of her fitness to use electrical apparatus before she can secure a situation. More electrical facilities need to be provided at the training centres that have been set up by the Ministry of Labour.

In addition to educating children and servants, a third means is to educate women through trained women, and Miss Haslett expresses preference for the term "electrical housecraft adviser" in place of "demonstrator." Inefficient demonstration is a hindrance, and the question of training is therefore very much in the forefront.

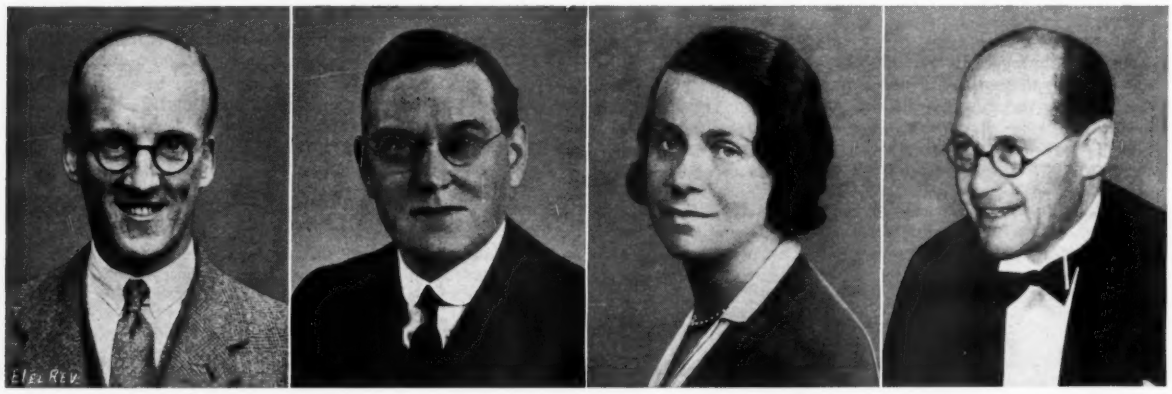
A problem which must be faced is that of salaries. The best types and best qualified girls and women will only be attracted if their conditions of employment are at least comparable with those in similar spheres of activity. Miss Haslett shows that for the same kind of work women in the gas industry receive very much more attractive salaries, and she feels that the electrical industry has hardly yet realised the service which women can give.

Before the industry can successfully educate the public it must first educate itself. It is essential to consider the consumer's requirements, to know and understand her point of view, her difficulties and her ideals.

Miss Haslett strongly advocates the setting up of a "National Proving House" to give the consumer confidence that what she is buying is safe. She also stresses the need for urging standardisation, not only of voltage and frequency, but also of accessories and manufactured apparatus. Other work of great value would be the collection of data, the production of a small-house wiring specification for the guidance of tenants and builders, and inquiries, for instance, into the time and human energy saved by the use of electrical appliances, their running costs, food values, household budgets, etc.

The Contractor's View

The second part of the paper is by Mr. T. E. Alger, representing the Electrical Contractors' Association, who considers the immediate need to be the strengthening of the "contractor effort" and to increase its speed and efficiency.



Mr. W. N. C. Clinch | Mr. C. Naudaud | Miss C. Haslett | Mr. T. E. Alger

Contractors have resented municipal trading and resisted rate-aided competition. They have had an uphill fight to pass on to the public the high charges demanded for energy, and time must be allowed for the public to get rid of the "expense" idea, which persists at the present moment. Contractors' efforts have also time and again been frustrated by high service charges and, in some cases, by deliberate discouragement of the load. These, Mr. Alger thinks, are the root causes of the antagonism hitherto observable between supply and wiring interests.

Ordinary commercial counsels must be allowed to prevail. Progress cannot be achieved without counting the cost, and the maintenance of reasonable trading profit lies at the root of their welfare as an industry. Failing the maintenance of this basic principle, they must rest content to see the whole industry turned into an experiment in the realm of applied socialism. There is no alternative, says Mr. Alger, whose endeavour is to show that neither enterprise nor money are forthcoming under speculative trade conditions. Stabilised trading and commercial security would, he considers, make both these necessities available in ample volume.

As a first practical step it is absolutely necessary to set up "Electric Circles" in every supply area which shall be truly representative of every reputable electrical interest in the locality. Development along these lines will ensure that all "points of public contact" in a given area are linked up in no half-hearted manner. The present haphazard scramble for business is a disgrace and involves losses which the public in the end has to make good.

Concurrently with these reforms serious attention must be given to certain technical and business factors. A national

minimum wiring code must be made compulsory with effective penalties for infringement. Mr. Alger does not say that the I.E.E. Wiring Regulations should be adopted *en bloc*, but that the present situation is farcical and a menace, and cannot be allowed to prevail much longer.

They must make up their minds between two- and three-pin outlets. Earthed equipment must be used in certain rooms, and it is folly to have two systems in operation. Also serious attention must be given to leakage-trip (circuit-breaker) protection, which is most efficient.

In priority to some of these matters immediate attention should be given to the production of a standardised system of assisted, or hire-purchase, wiring in conjunction with mass-production methods, which would result in better quality and substantially lower cost. A premium should be put on every *complete* installation provided in the first place. Partly equipped houses are lost to the industry as buyers and users of auxiliary equipment, and over devotion to lighting as the "thin edge of the wedge" has been responsible for much loss of business.

Mr. Alger suggests that the supply section of the industry should consider the possibility of offering a commission to the installation trade based on the number of socket outlets installed on domestic premises. Obstinate clients demand a good deal of "nursing" if complete installations are to be secured; and the first profit to be earned on such complete installations sets a definite limit to the time that can be devoted to securing the necessary installation instructions. It is equally necessary to instruct builders and architects as to what a reasonably complete domestic installation amounts to.

To avoid sinking capital in providing sub-circuits that will never be fully loaded, new consideration needs to be given to the protection of final domestic sub-circuits. The sensible solution seems to the author to be the provision of final sub-circuits with ample socket outlets thereon, but controlled in action by some simple form of electro-mechanical current limiter on the distribution board.

No supply authority can afford to load itself with unnecessary hire schemes. It is much better to urge the public to buy and own its domestic equipment, and existing non-economic hiring of the smaller appliances should be reviewed. A national showroom policy should be drawn up and all legitimate business interests given adequate protection.

The next step of grave urgency involves the setting up of a "Proving House" capable of exercising legal control over the sale of definitely dangerous equipment. So much having been achieved, the compulsory registration of contractors and wiremen could be left for some future, but not too distant, date.

Distribution Technicalities

The third section of the paper is jointly written by Mr. W. N. C. Clinch (representing the I.M.E.A.) and Mr. C. Nadaud (representing supply companies) who regard the authorised undertakers as, by statute, trustees of an essential service and consider that co-operation between all sections is a duty. The Electricity Commissioners' power to formulate joint authority schemes is limited, but the authors consider that steps to that end could now be taken by voluntary co-operation in such zones as geographical and technical considerations indicate to be sound.

In the long run cables laid on both sides of a road are a cheaper method than affording cross-road services. The most economic size of distributor cable should be based upon an assumed maximum demand of 2 kW per consumer, having regard to diversity. The cross-sectional area of cables for distribution purposes should not be less, per conductor, than 0.06 sq. in. As a rule where 4- or 5-core cable is used the area of each section (excluding the fifth core which is used for street lighting and other purposes) can with advantage be standardised at 0.1, 0.15, 0.2 and 0.3 sq. in.

Experience has proved conclusively the advantages of the two-part tariff. The authors prefer the expression "all-in tariff (domestic)" and suggest that it should be adopted generally. Uniformity of tariff, they consider, is essential, and it would be opportune for the Electricity Commissioners to obtain statutory powers for the adoption of such a tariff by *all* supply authorities. For domestic purposes the fixed charge should bear relationship, not to the rateable value, but to the size of the house and not be calculated on a straight line law. There is no conformity in the "unit" charge. The question is asked: Why should not the basis be standardised as a corollary to the grid tariffs?

Definite steps should be taken to standardise the charges for the hire and hire-purchase of similar apparatus and provision made for the wiring of installations to be carried out to a recognised specification by competent installation engineers. It is not desired to curb progress, but to regularise design in detail by standardisation.

Certain undertakings have set up "Materials Committees" (individual "Proving Houses"). A general application of this principle to all undertakings is necessary, and statutory powers should be granted to prevent the sale or use of materials and apparatus not complying with the minimum standard approved by a nationally constituted authority. It would also be expedient to standardise the declared voltage of supply.

The effects of the domestic load are summarised (and illustrated with tables and graphs) as an increase of electricity sold and its provision for general water heating. The provision of all-mains wireless receivers has, in itself, created a demand. For example, on the occasion of the recent royal wedding the load in one area of the country increased by 15,000 kW, and during the Grand National steeplechase an additional load of 6,000 kW was recorded.

Stimulation results from satisfied users becoming valuable "canvassers." The additional cost of a distribution system necessary to afford adequate supplies for every domestic purpose is relatively small. It is unwise to credit the public with a knowledge of electrical matters which it really does not possess. More effective propaganda is needed, and it is bad policy to cease advertising a line of goods which has secured the market. The authors stress the importance of a National Electrical Exhibition, considering that the time is ripe for such a venture.

To reap the fruits of greater publicity more "development officers" (canvassers) are desired by the authors, who submit that no law has been found to correlate the amount of maintenance necessary on apparatus with the type of consumer, but that it can be said that the least service is needed by the consumer who buys, while greater attention is necessary to those who hire apparatus.

The Electric Vehicle Display at Bournemouth

IN addition to having an information bureau on the E.D.A. stand at the Convention Exhibition, the Electrical Vehicle Committee of Great Britain is arranging parades of battery-propelled passenger and goods vehicles daily during the week. The following are included among the exhibits:

Nelco, Ltd.—A 10/15-cwt. chassis with delivery van body displaying products and luminous sign advertising by "Neoverter" equipment, and a 10/15-cwt. chassis with a 2.5-h.p. motor, axle-mounted direct drive, giving five speeds forward and reverse and half-speed range, has seating accommodation for trial runs. A "pram" chassis with a goods-delivery body has a 1.5-h.p. motor and series-parallel field control, giving four speeds forward and three reverse. A de luxe invalid carriage has four speeds forward and two in reverse, and is provided with two electric brakes.

D.P. Battery Co., Ltd.—A 30-cwt. chassis with covered van body (by permission of the General Electric Co., Ltd., and Carter Paterson & Co., Ltd.) fitted with "Cathanode" type KA21 battery of 320-Ah capacity.

Electricars, Ltd.—An 8-cwt. van, as used by electricity supply undertakings, has a range of 30/40 miles per charge of the standard battery.

Metropolitan-Vickers Co., Ltd. (P. W. Taylor).—Two 10/12-cwt. chassis of the three-wheel type with dairy and baker types of bodies.

A. E. Morrison & Sons, Ltd.—A three-wheel 6-cwt. chassis fitted with an air-flow bonnet-type body having a range of 75 miles at a maximum speed of 30 m.p.h.; also four 10/12-cwt. chassis, one without a body, another with a standard body, the third with a special streamlined body, for the Sunderland Corporation Electricity Department, and the fourth with a milk delivery body and a special motor having dual windings for low- and high-speed operation, the different windings being brought into use as the foot accelerator is depressed.

Partridge, Wilson & Co., Ltd.—Two 15-cwt. chassis, one fitted with a ventilated-type traction motor and "fluid" automatic controller, and the other with a general delivery van body; also a private town coupé with a special Mulliner streamline body, which has a range of 33/40 miles and a cruising speed of 27 m.p.h., as well as three 8-cwt. chassis, one with a streamline body similar to those supplied to the West Ham Corporation Electricity Department, and the others with a van body and a closed milk distributor body, both having a totally enclosed traction motor with asbestos insulated windings and a relay interlocking-contactor controller.

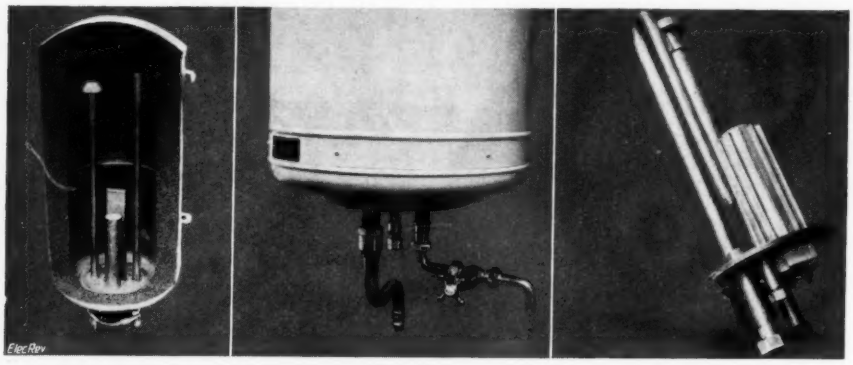
Victor Electrics, Ltd.—A chassis with a van body, is suitable for loads up to 25 cwt. with speeds up to 20 m.p.h., and another, for loads up to 15 cwt., has four forward speeds and three in reverse and is fitted with new quick-charge batteries, giving double mileage from one vehicle.

Cooking and Heating Developments

The trend as indicated at the National Convention Exhibition

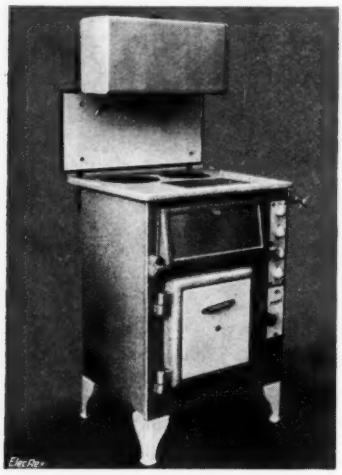
By OUR SPECIAL REPRESENTATIVE

I WOULD not like to have to say what is the more important aspect—commercial or technical—of any one of the most modern developments to be seen at the Exhibition, but it is pretty safe to state that in many cases the commercial reason is hidden by a technical advantage. I refer to commercial aspect in the narrow sense.



Benjamin water heater with removable top; Heatrae tank with second outlet; "apparatus" of E. E. "Quick Recovery" cylinder

There seems to be something essentially businesslike behind such moves as that of the English Electric Co., Ltd., in introducing a cooker complete as such, but without "frills." I would not dare to call fuses "frills," but Mr. McKenna told me of one large supply undertaking which has reported less trouble as the result of omitting them. An intermittent earth on a plate is not located on test, and the fault is not found until a "dead-short" develops and blows the main fuse, perhaps after several maintenance visits.



Combined cooker and water heater (Hotpoint)

Probably such troubles could be overcome by the earth leakage trip unit introduced by Messrs. A. Reyrolle & Co., Ltd., but this has been designed mainly for use in rural areas where good earths are not readily obtainable. It is essentially a cooker control unit with a magnetic cut-out which trips on 3 mA leakage current.

Automatic oven temperature control was much in evidence, but most makers are not convinced that the development is a good one. Automatic control demands a straight-line temperature curve, whereas good cooking—and particularly electric cooking, I have always been taught—is done on a falling curve. It was all very well to answer the gas "Regulo," I heard, but automatic gas control was introduced to overcome varying pressure difficulties. I even heard it said that if automatic control is to become fashionable, present cooker design will have to be changed.

One good point, I think, was made by Siemens Electric Lamps & Supplies, Ltd., namely, that the automatic system meant finer temperature regulation. Messrs. Moffats, Ltd., pointed out to me that it affected the overall cost of the cooker very little because of the elimination of the usual oven switch and the thermometer.

On a new "Tricity" table cooker I saw both an automatic control device and a three-heat switch, and Mr. Steele explained that the scheme permitted sectionalising the heat for various kinds of cooking. In the system devised by Simplex Electric, Ltd., there is a simple "on" and "off" switch operated by the remote control rod so that the circuit is switched on at a little less than one-third heat.

On an "Xcel" cooker I saw both the automatic control unit and an incorporated main switch. The main idea behind the latter switch is to facilitate installation work, but I believe a lot depends on the answer, if there is an authoritative one, to the question: Does the built-in main switch comply with I.E.E. Regulations? "Falco" cookers supplied to Glasgow are of the old British Standard cooker design with the switch box extended downward to take a main switch and a kettle plug.

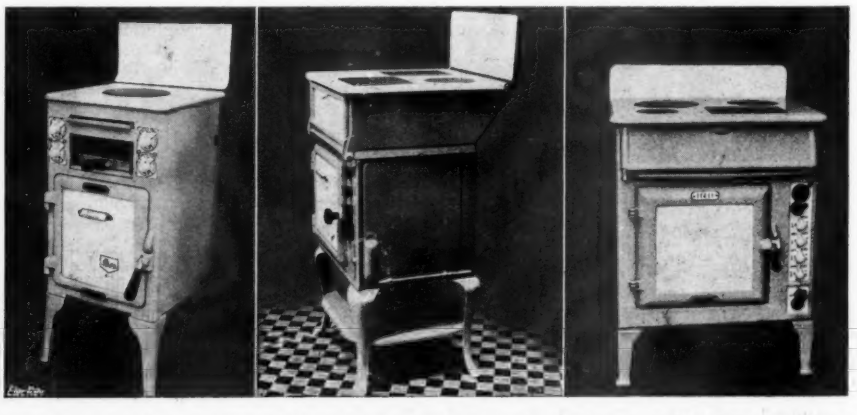
After inspecting a "Tricity" cooker of the normal removable oven interior type, but with the lining fixed and cemented up at the front, I must ask—Is there anything new in the "exterior" oven element idea? But accessibility of the elements from outside the oven, as in Simplex, Belling & British National cookers, is another matter.

It is difficult not to refer to "Colonial-type" cookers, but with further mixing of ideas it may not be necessary soon. The drop-down door is persisted in, however.

To see the new chef's single-unit range, with its drop-down door, displayed by the Jackson Electric Stove Co., Ltd., made me thing it a pity that so much space was taken by this type of door in the average small kitchen. Mr. Fright was kind enough to point out to me though, that whereas in commercial cooking it was generally advisable or necessary to have special designs of equipment for certain work, in the domestic field it was essential that one cooker only should serve all purposes. All interested in electric cooking should be constantly reminded of that fact.

Width reduction seems to be the important thing nowadays—at least on the smaller cookers. On the new 93J Jackson, as compared with the new 92J, an extra boiling plate has been installed without increasing the width by "throwing out" the hob at the back. And then there is the scheme of building in the switches and fuses between the hob or hot-cupboard and the oven such as that employed in the new small "Falco" equipment. I have seen a cooker produced by Revo Electric Co., Ltd., complete with a separate grill (1,500 W), a 2-kW boiling plate, and an oven loaded at 1,500 W, all within a cooker width of 11½ in.

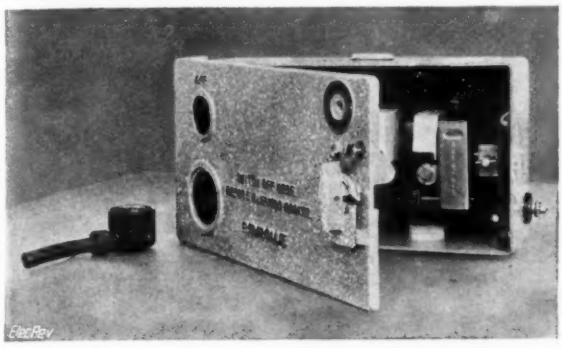
All is not well with the boiler-griller and, candidly, I was delighted to hear a Falkirk representative refer to it as wasteful, while Messrs. Moffats say that it is neither one thing nor



Small Revo cooker with separate grill; Jackson 93J with "thrown out" back; automatic control and main switch on an "Xcel" cooker

the other. Two moves to speed up boiling are the Creda stainless-steel bar covers and the lighter casting permitted by the special cast iron used by the English Electric Co.

On the latter company's stand I learnt that the enamelled top boiler-griller has proved popular in the North for the direct cooking of scones. And I have heard of a new low-voltage griller-boiler ("Tricity") with ten steps within load-



Reyrolle control unit with earth-leakage trip

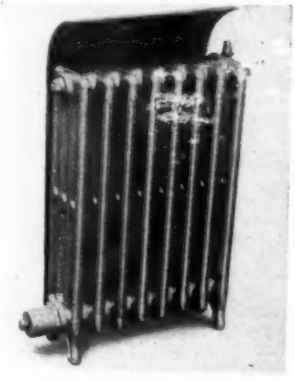
ing limits of 800 W and 2,250 W, while Falk, Stadelmann showed me their purely experimental infinitely variable control system. The transformer flux is made variable by a hinged "link" in the core.

The novelty of the exhibition, I should say, is the combined cooker and water heater shown by the Hotpoint Electric Appliance Co., Ltd., closely following its combined cooker and refrigerator. I feel pleased about the former because the ELECTRICAL REVIEW has repeatedly stressed the importance of linking to some extent water heating and cooking. The cooker-refrigerator idea is purely one of space saving.

Because I have heard more than ever about larger quantities of hot water at quick demand I feel inclined to ask: Are we departing from the thermal storage idea of a tank large enough to meet normal requirements over a period? After all, thermal-storage water heating is a sound and essentially electrical development. Of course if sufficiently high loadings are to be permitted and are practicable, quick heating to any degree will be a fairly straight problem.

Of the moves I saw to afford more adequate supplies of hot water quickly there is the Simplex scheme in which the hollow immerser acts as a circulating tube while heat is emitted from outside the tube into the bulk of the water. An English Electric development embraces a short element in a finned case which creates turbulence, and has only a 3-deg. difference of temperature between the top and bottom.

In the larger displacement tanks produced by Messrs. Bastian & Allen, Ltd., water enters at the rate at which it is heated. In the new cistern heater marketed by Messrs. Johnson & Phillips, Ltd., the water from the cistern first goes into a separate heating chamber in which it is heated to draw-off temperature, and then flows over into the storage chamber which can be completely exhausted with all the water at maximum temperature.



H.W. radiator with insulated back deflector (Geo. Nobbs)

Mr. Robson, of Messrs. George Nobbs, Ltd., is an enthusiast for booster heating, and he told me of one case where a 20-gal. tank with two 2-kW heaters (one boosting) is giving the service previously provided by a 60-gal. tank with one 4-kW heater.

I believe that a double outlet non-pressure tank developed by Electric Fires, Ltd., will meet a definite need. The second outlet is taken to the kitchen downstairs where it carries a tap. But this outlet can only half empty the tank or to a level above the top of the element. The arrangement will avoid journeys to the bathroom for supplies of hot water for the kitchen, but refilling can only be done from upstairs. Not an ideal arrangement, but an advantage where the ideal is probably unattainable. This company also showed me an unlagged tank with a circulator, and so did Messrs. Archibald Low (10 gal., 4 kW). Here again is simple equipment, comparatively crude perhaps, but something which represents advance to a certain class of consumer, and will bring business to the manufacturer and the supply industry.

My attention was drawn to many schemes for overcoming scaling difficulties, and the main idea seems to be to increase the heat emission area of the element unit. In the new equipment produced by Aidas Electric, Ltd., in which the heat is transmitted through a non-deteriorating semi-liquid the emission area is doubled. The fins on the element unit in the English Electric "Quick Recovery" equipment to which I have already referred result in a loading as low as 10 W per sq. in. Reyrolle's quoted 7 to 8 W per sq. in., pointing out that in the larger equipments they use two or three separate elements. But with 2 W per sq. in. (on the larger sizes) I should think the flexible immerser produced by the J.P. Tubular Heater Co., Ltd., takes the prize.

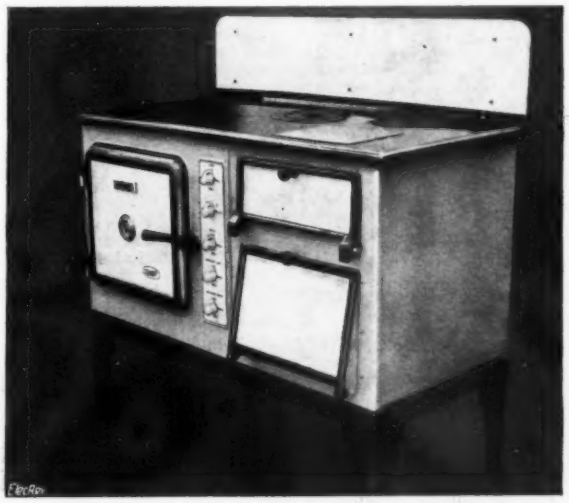
I think fire manufacturers must be having rather a prosperous time just now. Time and time again have I heard that inset fires are selling "like hot cakes." It seems that the large modern estate builder has realised that he can save £10 or more per house by the elimination of a chimney or so, even when installing a fairly high-quality electric fire. The development is really extraordinary.

In this class of equipment I include wall and panel fires which do not require any brick excavation. Messrs. Ferranti, Ltd., have a fire which hangs on to its surround, and can be hooked off and used as a portable unit by virtue of a back bracket. Messrs. Belling & Co. showed me one which hangs on to its tray back which is first screwed to the wall. Corner fires, mantel-shelf units, horizontal and vertical bars, and reflectored rod elements, special imitation fuels, double flickering arrangements, "crushed strawberry" and chromium plating finishes are just a few of the refinements which I saw.

Ferranti panel fire as a portable

Every two years or so most makers talk "psychological effect"—just for a little while. One of the latest efforts in this direction is the new reflector fire produced by the Manor Electric Oven & Fire Co., Ltd., the horizontal-rod elements are separately reflectored, and near the bottom of each trough there is a slit. Light from a ruby lamp at the back of the reflector is projected through the slits, impinging on the rods which are thereby reflected as glowing elements in the reflectors.

Messrs. Greene, Phillips & Co. have modified their element design so that all the convectors are very much reduced in overall size. There are still four coils per kW, but now each coil is split and the two sections are arranged concentrically, so that there is the same loading and the same surface area within decreased overall dimensions in the various types of cabinets.



"Tricity" cooker with automatic control and three-heat switch

Some Particulars of the Exhibits

Nearly seventy manufacturers are participating in the exhibition which is being held at the Winter Gardens, Bournemouth, in conjunction with the Convention. This is an increase of about ten on the number at the I.M.E.A. Convention last year. Readers will notice from a perusal of the following notes that, in spite of the British Industries Fair having only just concluded, several manufacturers are exhibiting new products for the first time.

Aidas Electric, Ltd.

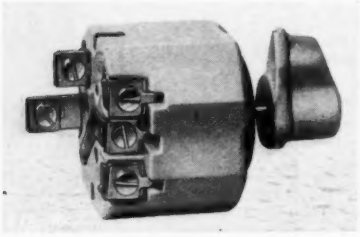
The most recent addition to this range of "Sadia" domestic water heaters is a 1.5-gal. model of the free outlet pattern which incorporates a positive anti-drip device. Safety and the minimisation of internal furring have received special attention in the design.

Archibald Low Electrics, Ltd.

Various types of water storage heaters range in size from 1.5 to 20-galls. capacity and consist of the open outlet type, combined cistern and ball valve type, and the pressure type. Special attention is drawn to the rectangular model which is claimed to be particularly suitable for hard water. In the 1.5-gal. rectangular-type heater an anti-drip device is incorporated which can be removed through the top of the tank and cleaned without removing the baseplate. Other items are immersion heaters, top- and side-entry circulators, small heaters for fitting under basins, tubular heaters, and instantaneous water boilers.

Arrow Electric Switches, Ltd.

Rotary switches range in size from 3 to 35 A at 250 V for flush and surface



An Arrow double-pole side-connected cooker switch

mounting. Shown for the first time is a complete range of flush mounting rotary switches with connections on the back to take care of every load requirement between 3 and 35 A. In addition there is a new double-pole 3-heat, side-connected cooker switch that is interchangeable with the present types of single-pole, 3-heat, side-connected cooker switches.

Water heater control units consisting of a white cellulose enamelled pressed steel box fitted with a rotary switch and pilot light are introduced for the first time.

New tumbler switches have been specially designed to meet present-day requirements of all types of domestic appliances using small motors. The switches are the enclosed type, dust-proof, and for flush mounting. They are provided with special arc snuffers.

A complete range of motor starting switches for electric tools is also being exhibited.

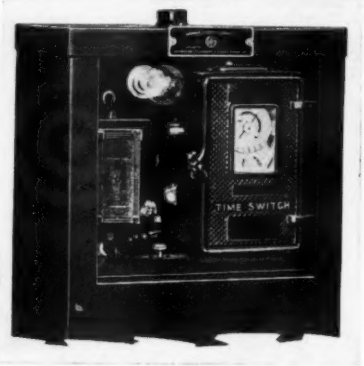
Apparatus (illus.) for mechanically and electrically testing both tumbler and rotary switches with varying load capacities and circuit arrangements is an exact copy of the one used in the factory for testing quantities of switches taken from each production run. There is also a display showing the various manufacturing processes.

Automatic Light Controlling Co., Ltd.

This range of "Gunfire" time switches includes hand-wound types for 16-40 day runs, also synchronous motor-driven models, and several other types.

Automatic Electric Co., Ltd.

Demonstration equipment for the "Strowger" system of centralised street lighting control shows how up to 500 street lights over a radius of 1½ miles can be switched "on," "half-off," and "off" automatically from one central point. The equipment consists essentially of a master transmitter (illus.), which may be located for convenience in the central or sub-station, and a lamp unit (an electro-magnetic switch) for each street light. The lamp units are built to standard pattern and are interchangeable. No pilot wires are required and instantaneous emergency control is provided.



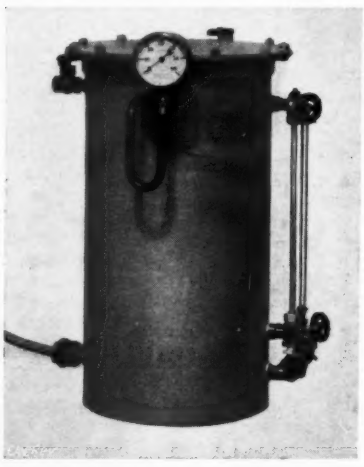
Part of a self-contained master controller of the A.T.M. centralised street-lighting control system

In addition, a large display piece will depict a typical street scene with automatically controlled lighting.

Bastian & Allen, Ltd.

Besides their more normal use for heating private residences and larger buildings, garages, baths, etc., small electrode boilers (illus.) are used for steam raising for steam-cooking, hospital sterilising, and in dairies, &c.

The special electrode steam boiler designed for farmers, dairymen and small steam users can be set for any loading up to 20 kW and evaporates 60 lb. per hour at 15lb. per sq. in. pressure. As steam is raised within a minute of switching on, the boiler is only in circuit during the time that steam is being used. A working model of one of the larger boilers appears on the stand.



Electrode steam boiler (Bastian & Allen)

An example of the range of the different types of domestic electric water heaters manufactured serves to show the robust nature of their design and the pleasing external finish.

Belling & Co., Ltd.

A full range of electric cookers includes the new *de luxe* model fitted with a door consisting of two thick plates of glass with an air space between to provide heat insulation. The special construction prevents "steaming." The oven is fitted with "Temset" automatic control of temperature and is back-vented and is removable.

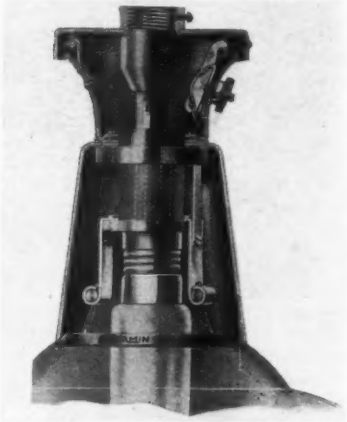
To the smaller models there has been added the "Modernette" on legs with a shelf beneath. The 1.5-kW self-contained oven has a heat indicator and the 2,000-W combined boiler griller on the hob is sufficiently large to keep several pans boiling at the same time. The new "Baby" Belling has a total loading of 2,500 W, the single heat oven element being of 500W. The double-purpose boiler-griller plate can be used both above and below simultaneously. A similar plate is fitted to the new breakfast cooker, which has a drop-down door.

The display is completed with a selection of the latest built-in fireplaces with coloured surrounds and wall panel radiators of varied designs. The projection at the back is only 1 in. so that these fires can be fixed without cutting away the wall or plaster.

Benjamin Electric, Ltd.

This display consists almost exclusively of industrial and commercial lighting equipment. Particular emphasis is laid on the "Saaflux" system (illus.), which utilises reflectors that are detachable complete with lamp as one unit.

This method simplifies wiring and fixing, improves earthing, and keeps the



Benjamin "Saaflux" lighting unit in section

connecting cables cool. The supplementary reflector makes it impossible for the lamp cap to be touched when it is making contact with the lampholder, and thus shock risk is minimised. The supplementary reflector redirects 5 per cent. more useful light which is normally lost up the neck.

Berry's Electric, Ltd.

The main item is a replica of a section of the principal room in the gift house presented to the King by the Royal Warrant Holders Association, showing one of the Berry fires designed for installation therein.

Other fires of the latest types are on view in one of the company's travelling showrooms which will be in attendance at the show. Water-heating apparatus, including a new type of circulator, will be available for inspection in another travelling showroom.

Bournemouth and Poole Electricity Supply Co., Ltd.

This company's stand is in the form of an inquiry bureau, together with a lounge. The company's new offices and showrooms were officially opened recently, and an illustrated description of the building appeared in our last issue.

George Bray & Co., Ltd.

The newest item is an "anti-scale" immersion water heater. It consists of a separate heating chamber, in which the "Chromalox" elements are enclosed, for insertion into the storage tank. Means are provided for automatically filling the auxiliary chamber when first put into service and also for making good losses due to evaporation. Scale deposits in the heating chamber are therefore limited to the hardness of the initial quantity of water admitted, plus the make-up, which is very small due to the construction of the heating chamber.

Metal-clad embedded type strip and

ring elements and cartridge heaters are made for industrial purposes up to 1,000 deg. F. For domestic uses there are immersers, circulators, radiators, boiling and range plates, kettle elements, as well as a selection of refractory insulating ware.

British Electrical Development Association

This stand demonstrates the various national and local publicity services instituted by E.D.A. A decorative feature at the back is a series of small modernistic dioramas indicating the dependence of the "man in the street" upon electricity in all his pursuits. In the foreground seven plinths each incorporate an illuminated poster, and in front is a spacious rest lounge.

British National Electrics, Ltd.

Among domestic cookers are models C1 to 4 which have not so far been exhibited to the trade. The C1 and C2 are small cookers without legs, having overall dimensions of 19¾ in. wide by 13½ in. deep and 20 in. high, the oven being approximately 11¼ in. wide by 11 in. deep by 10¾ in. high, with a loading of 1,800 W.

In respect of the C.1 model, the hob equipment consists of one grill 8¾ in. deep by 8¼ in. wide, with a loading of 1,800 W, and one 8 and one 6¾ in. diameter embedded type boiling plates loaded to 1,800 and 1,000 W respectively. The C.2 model is exactly similar, but with one grill and one 8 in. boiling plate.

The C.3 model has been designed for the Colonial market and incorporates a drop down door on the oven. The overall dimensions are 21 in. wide by 18 in. deep by 36½ in. high, and the oven cooking space is 13 in. wide by 13½ in. deep by 11½ in. high, with a loading of 2,000 W. The hob equipment consists of one 8 in. and one 6¾ in. embedded type boiling plates, loaded to 1,800 and 1,000 W respectively, while an 8½ in. by 10 in. grill, loaded to 1,800 W, is incorporated in the oven top. The C.4 cooker is exactly similar, but fitted with one 8 in. plate.

Two new breakfast cookers, B.C.2 and B.C.2a, with overall dimensions of 19¾ in. wide by 12¼ in. long by 12 in. high, have hob equipment consisting of 8 in. and 6¾ in. diameter embedded type boiling plates in the B.C.2, and one only 8 in. diameter boiling plate in the B.C.2a. An independent grill plate is incorporated, loaded to 1,800 W with dimensions of 10 in. by 8 in.

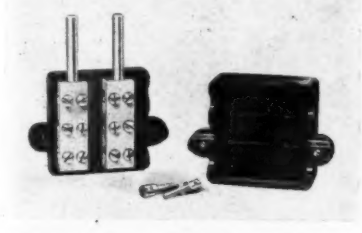
The range of small appliances includes coffee percolators, toasters, waffle irons, synchronous electric clocks, etc.

Apart from the C.11b breakfast cooker fitted with the M.V. radiant element an alternative form of M.V. element has a medium loading of 375 W over an area of 6 by 4 in.

British Sangamo Co., Ltd.

These watt-hour meters are of the all-insulated type, having bakelite cases made in the company's own moulding shops. The H.M.-type single-phase meter is very accessible and has interchangeable parts. The three-coin prepayment model has one slot only for pennies, sixpences, and shillings; there are also single- and two-coin models.

For consumers accepting hire-purchase terms a fixed-charge collector can be fitted to all large base prepayment meters to collect from ½d. to 1s. 10½d. per week in ½d. steps, 1d. to 3s. 9d. per week in 1d. steps, and 2d. to 7s. 6d. per week in 2d. steps. The collector embodies a self-starting synchronous motor, and the rate



British Sangamo splitter block with cover removed

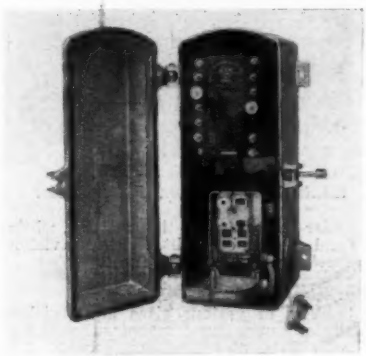
of collection can be easily varied in less than a minute without removal of the meter cover. An arrears dial indicating up to 20s. is also incorporated.

To avoid the bunching of wires when three separate circuits have to be connected to a single meter there is a small splitter block (illus.), consisting of a moulded bakelite case containing two terminal studs for insertion into the load side of the meter. As one of the terminal studs is adjustable it can be fitted to meters of all makes and is available in capacities of 2½ to 20 A and 25 to 50 A.

The standard time switch type "S," a synchronous model controlled by a self-starting synchronous motor is enclosed in a weatherproof aluminium case with separate terminal chamber. The switch can be supplied with a solar dial and advanced or late time cutouts. Complete clock movements are shown.

British Thomson-Houston Co., Ltd.

This company is floodlighting the Hotel Burlington, Boscombe, and the Royal



B.T.H. street lighting control box

Bath Hotel, Bournemouth, with "Mazda Mercra" lamps.

At the Exhibition is a representative range of B.T.H. lighting equipment, which includes street lanterns and floodlight projectors for use with both "Mercra" and gasfilled lamps, and industrial fittings for use with "Mercra" lamps, together with lamps for general and decorative lighting service.

There are also "Mazda" light tubes of various colours, shapes and sizes for architectural and decorative lighting.

Bulpitt & Sons, Ltd.

On this stand is a full range of electrical specialities embodying the "Swan" brand immersion type element for the cooking utensils. These include kettles, percolators, porringers, tea urns, steam cookers, etc., as well as a comprehensive range of electric fires, comprising bowl, panel, screen, inset, etc., types.

The flat-bottomed ware for use on electric hot plates is also shown, and two new lines are wash boilers and the latest kettle, which boils three pints of water in five minutes.

Burnley Components, Ltd.

The "Turbulator" (illus.) is a device

The "Burco Turbulator" fitted in a wash-boiler (Burnley Components, Ltd.)

for converting the "Burco" clothes boiler into an automatic washing machine. It is constructed of sheet steel, galvanised after manufacture, and slips easily into position inside the boiler. No fitting is needed, and the inner container is not obstructed. When the water boils it surges upward and out through the spout of the "Turbulator," the displacement being at the rate of 500 gallons per hour. Thus a stream of boiling water is forced through the clothes continuously, with, it is claimed, a quickening of the washing action and improved cleansing.

"Burco" clothes boilers include three grades for hiring and housing schemes, as well as *de luxe* models. A low-priced boiler for builders is offered.

Cable Makers' Association

This exhibit is in the form of a display panel of flexible connecting cords for portable domestic appliances, conveniently arranged for inspection in the centre of the lounge in front of the E.D.A. stand.

Carron Company

A full range of electric cookers covers all family requirements, while breakfast cookers also find a place. The "Carronette" and "Carronian" cookers and the breakfast cookers, particularly the B.2 type, have been widely adopted by supply authorities for hiring schemes.

Electric fires in a wide variety range from the cheap heater to period models of the coal fire type. The company has

A Carron inset fire

been devoting special attention to the manufacture of inset fires (illus.). Several examples of these fires are on view, finished in enamel in a variety of pleasing colours. Tubular heaters and irons, nickel-plated and enamelled, are also included in the display.

Corfield-Sigg, Ltd.

The latest addition to this range of flat-bottomed aluminium hollow-ware and kitchen utensils is a waterless steam cooker with a ground base, which can be fitted with multi tiers, for use on a hot plate. A useful outfit comprising a kettle, saucepan, and coffee percolator, combined with a 900-W portable hot plate has been introduced for flats, &c.

Also prominently displayed are tea urns and stock-pots, with ground bases, triple pans, and other "Crown Merton" lines in the new "Sun-ray" finish. The latest kettle has a bimetal cut-out and removable immersion type element of 750, 900, or 1,000 W, and is mounted on porcelain feet. The 450-W coffee percolator is of 2.5 pints capacity.

Drake & Gorham Wholesale, Ltd.

Among general domestic appliances is the "Teesmade" outfit, which is automatically controlled by a clock. At a pre-set time a kettle is switched on, and when the water boils it empties itself into the teapot and then switches itself off. There is a varied selection of "Densacone" water heaters of different types, and "Nolos" heat-insulating jackets for lagging hot water cylinders.

"Dragor" clothes wash boilers are available in several styles and finishes, including coloured enamels. The inner pan base is free from studs, being fitted with an "M.V." radiant tubular heater. A steam condenser and hinged lid are fitted, while type "M.W." is rectangular

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and has a hand-operated agitator which is simply lifted in or out of the pan for washing the clothes in the boiler pan itself. Three heat control is provided.

Edison Swan Electric Co., Ltd.

The new high-efficiency "Jubilee" street-lighting lantern (illus.) for use with the "Ediswan Escura" discharge lamp embodies a special optical system. The canopy is a one-piece casting, to which is hinged the heavy gauge copper body carrying the glasses. The unit is dust and weatherproof, and gives easy access to the lamp.

The floodlighting of the Exeter Hotel, Bournemouth, has been carried out with the new "Sirius" "H" flood lantern, which has been designed to give a wide flat beam for high buildings with small projection. The arc of the "Escura" lamp is maintained centrally by the magnetic field of the choke mounted immediately beneath the lantern.

Other floodlighting equipment includes the "Mars," "Juno," "Cygnus," and "Waltham" projectors, the last-named being designed for use with "Escura" lamps. The "Saturn" rectangular lantern can be used with either ordinary incandescent or discharge lamps.

Two exhibits for exterior and interior lighting are the "Wanstead" and "Orion" lanterns, the former being particularly suitable for illumination by means of discharge lamps of large areas.

"Ediswan" Jubilee street lantern for electric discharge lamps

In the decoration of the stand itself, prominence has been given to "Ediswan" architectural lamps.

Electrical Association for Women

The E.A.W. exhibit is similar to the one shown at the Ideal Home Exhibition, 1935, but, being at a corner, it has greater frontage. A triptych (illus.) surmounted by slogans displays on each of the panels one of the well-known E.A.W. educational charts. The switches and accessories used in a house, and their relative positions of use, are shown on two side panels, and the centre of this face of the stand is filled by a display of E.A.W. literature.

On the other face of the stand are statistical cartoons showing what use some working women have made of electricity.

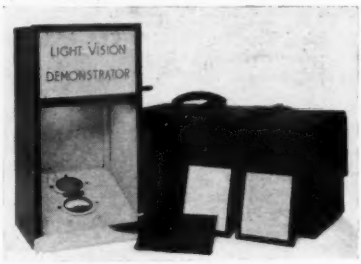
Electrical Contractors' Association

A number of members of the Bournemouth Branch of the Association have a joint stand which is fitted out as an information bureau for the assistance of visitors.

E.L.M.A. Lighting Service Bureau

In contrast with usual boxed-in stands this one is singularly open. The central feature is an 8 ft. light-vision demonstrator is stainless steel (illus.). Seated in this the visitor can adjust his reading illumination from 5 to 300 foot-candles at will. Having selected what best suits his eyesight, he can then press the control lever and the machine will present him with a ticket indicating his exact lighting requirements.

There are graphs, charts, light-vision demonstrators, and other potent ammunition for the trade to use in overcoming popular inertia in lighting matters, while a fund of data on sight, light and vision is freely available to the trade.



E.L.M.A. light vision demonstrator

English Electric Co., Ltd.

Cookers of various sizes and finishes include a new small model suitable for use in flats, and breakfast cookers.

A 1½-gal. push-type, 5- and 20-gal. pressure type, and a 12-gal cistern-type water heaters are exhibited, in addition to a new 1½-gal. "Insto" type with the body finished in bright black, with a chromium-plated top and base.

There is a range of portable electric fires in sizes from 1 to 3 kW in a large variety of finishes, as well as reflector fires with chromium-plated frames and pedestal base models. New portable fires are constructed of pressed steel. Among wall-type surround inset and mantel-surround fires two new inset fires of 1 and 2 kW, of special interest to builders, have a front frame of close-grain cast-iron finished in vitreous enamel, the colours available being sunrise or rainbow finish.

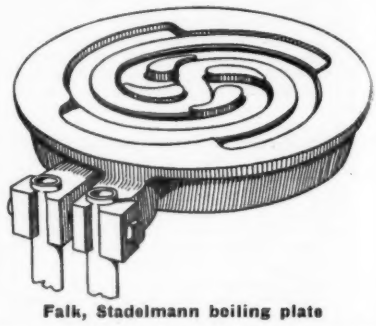
Two new lines are a chromium-plated "streamline" iron and the "Enelco" coal-effect fire, which is constructed of rustproof sheet steel and is available in two sprayed finishes. The back and base are flat so as to fit against a wall or stand in an open hearth. Two 1-kW elements are provided above the artificial coal.

E.A.W. electrical display panel

Falk, Stadelmann & Co., Ltd.

A complete range of "Servis" cookers, incorporating models Nos. 3, 5, 6, 7, 8 and 9, covers the requirements of all average families. The oven wiring system substitutes a low and extra low loading for the usual medium and low. This system, while permitting the use of three interchangeable oven elements, provides a low heat a quarter of the total.

The "Express Servis" boiling plate (illus.) is of the transformer-operated



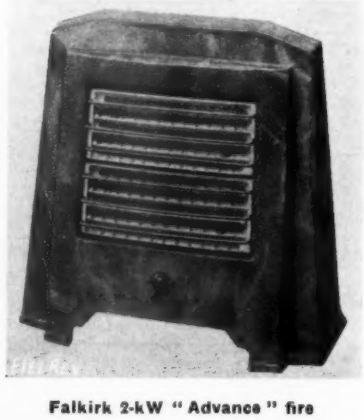
Falk, Stadelmann boiling plate

type; the element works at 6 V, and is of robust construction. Another exhibit is the latest radiant boiling plate, the loading of which is adjustable.

Thermostatic oven control will be fitted to certain cookers, and a patented method of control is exhibited for the first time. A complete range of "Efesca-Servis" fires, both portable and inset models, as well as domestic appliances, is shown.

Falkirk Iron Co., Ltd.

These goods comprise a range of domestic cookers, which includes the No. 5359 model; also breakfast cookers and irons, as well as portable, wall and mantel fires, among which is the "Advance" fire (illus.)



Falkirk 2-kW "Advance" fire

Ferranti, Ltd.

In the latest range of fires are types (illus.) designed specially for the architect and builder. Heating of the surrounding structure is guarded against, and the reflector, while retaining the essential Ferranti characteristics, produces a rather more diffused beam.

Among thermal storage water heaters are examples of immersion heaters, circulators and "Thermolators," combining the "Adjustostat" feature which provides for ready control of the water temperature by the domestic user.

Ferranti fire which gives a diffused beam of radiant heat

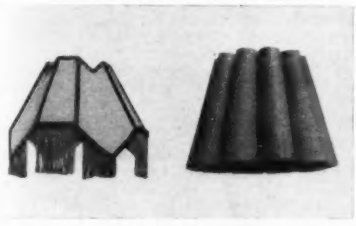
There are a.c. bell-ringing transformers, electric clocks for mantelpieces, for inset mounting and for wall and ceiling fixing, and typical examples of radio sets and radiograms for the coming season.

In addition to the complete range of "FL" meters, single-phase and polyphase, sectional models of optional coin prepayment meter and summer and winter tariff prepayment meter are on view.

In a selection of 2½-in. indicating instruments are electrostatic voltmeters of very small compass for pressures up to 12,000 V, pocket-type multi-range test sets for a.c. and d.c., a pocket light tester, a thermal maximum demand meter for substation use, miniature current transformers, self-starting synchronous motors and a new synchronous clock with stop-and-start switch.

Furn-Art, Ltd.

Typical examples of fabric fittings for decorative illumination in hotels (illus.), dance halls, theatres, etc., appear on this stand, together with the latest examples of "Furn-art" illuminated vases, screens, pendants, table and floor standards, and



Furn-Art pendants for hotel lighting

bedhead shades. Coloured designs of large and small neon installations for exterior and interior announcements are displayed, while sets of neon tubes show the colours available.

General Electric Co., Ltd.

"Magnet" cookers, including two new heat storage models, are being demonstrated, together with water heaters of from 1½ up to 20 gallons capacity, and immersion heaters, as well as a new internal circulator for converting storage tanks to electrical heating.

A wide range of domestic appliances is supplemented by a newly introduced electric washing machine. Electric fires are also represented, and lighting apparatus figures largely. "Osira" electric discharge lamps, in conjunction with specially designed lanterns, and street lighting guard posts, or bollards, figure prominently in the display.

Mercury vapour and sodium electric discharge lamps for floodlighting purposes are being demonstrated both at the Exhibition and in various parts of Bournemouth, while G.E.C. lighting installations are in operation at the Royal Pavilion, the Winter Gardens, Poole electricity showrooms, St. Peter's Church, *Bournemouth Echo* building, and in Holdenhurst Road. Special window displays are featured by Messrs. Aish & Co., Bacon & Curtis, J. J. Allen, Ltd., and other contractors in the town.

George Green & Co.

In this selection of "Gee-Gee" heating appliances are immersion heaters, urns, washboilers, storage water heaters, towel

Heating element for domestic utensils (George Green & Co.)

rails, hot water radiators, soldering irons, glue pots, wax heaters, motor-car heaters, a new "safety" kettle and heating elements (illus.) suitable for domestic utensils.

Greene, Phillips & Co.

A special claim made for the "P.H." convector (illus.) is that it is the only one on the market operating at a low temperature. It has the merit of discharging the whole of the heat generated into the space required to be warmed without loss to walls or ceilings. The latest model is the "Minor," the particu-

"P.H. Minor" low-temperature convector (Greene, Phillips & Co.)

lar feature of which is that the size and price have been reduced by half without lowering the efficiency of the heater.

These convectors are obtainable in metal, oak, walnut, and mahogany cabinets of modern design, and they can be recessed into furniture.

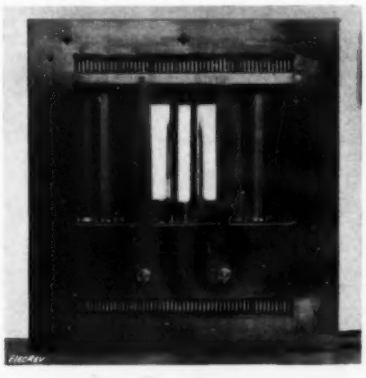
Hague & McKenzie, Ltd.

The addition of 30 new shapes and sizes of utensils now brings the range of "Pyramid" aluminium ware up to 150, all specially constructed for electric and hot-plate cooking. There are recently introduced ranges of bain marie, sauté and sauteuse pans for use in hotels, ships, and institutions; 12-in. diameter saucepans, casseroles, and steamers; square frying pans, porringers with china linings, shallow twin and triple pans, and patent milk boilers.

The subsidiary Birmingham Electrical Manufacturing Co. exhibits such domestic appliances as kettles, toasters, and irons, including a recently produced "Pyramid" model fitted with a new 45 deg. entry "Anka" connector.

Hanovia, Ltd.

The "Homesun" portable ultra-violet lamp will work off any outlet. Its quartz



Hanovia "Alpina" solarium

tube burner is available for both a.c. and d.c. (200-260 V) for indoor sunbathing.

The "Junior" portable serves the same requirements, but is less powerful, cheaper, and consumes slightly more current. It utilises a burner of special patented glass transparent to ultra-violet rays.

The "Wall-Sun" combines a special glass burner (generating ultra-violet rays) with two bar-type heating elements (500 or 1,000 W each, as preferred). The entire unit is designed as a panel fitting for building in or fixing on the wall and the components work from separate switches.

The solarium pendant fitting will flood large rooms or halls with rays equal to summer sunshine, and 2- and 4-burner units have been designed. All these lamps are fitted with self-starting electronic discharge are tubes.

Harcourts, Ltd.

In addition to typical examples of modern decorative type lighting fittings two new units are shown for the first time.

The "Reflecto" diffuser has been specially designed for providing better and more economic interior lighting of large business premises, an important feature of the design being that it is equally suitable for 300/500 W gas-filled or mercury-vapour lamps.

The "Heatlite" (illus.) is a rod suspension fitting which consists of a 17-in. diameter metal dome with a heating unit in the centre, an outer metal band being provided with two semi-circular architectural lamps which enclose the heater. This combination should be suitable for modern bathrooms.

Another development comprises examples of wall bracket fittings in which architectural lamps form an artistic feature of the general design. Other items are a range of all British "X-ray" re-

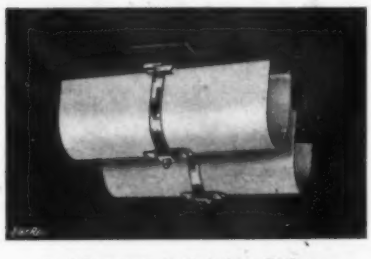
Harcourts "Heatlite" combination

flectors for shop window lighting and "Mirolux" trough reflectors for churches.

L. G. Hawkins, Ltd.

There is a new "Supreme" washer, a small "Ferret" cleaner at a low price and novel cigar lighters. The "Culinaire" is being continuously demonstrated, and, in addition, there are such items as floor polishers, coffee percolators, hair dryers, shaving mirrors, and heating pads. "Crystaline" domestic lighting ware is available in pastel colourings of apricot, pink and golden primrose and is constructed almost entirely of glass, the edges of which are finished with a crystal scintillating effect.

"Adaptolite" adjustable standards include twin models for double desks, sliding rod models, wall models and floor standards. The "Supreme Cozilite" is an inexpensive table lamp with glass base in six colourings and decorations. Combination lamps comprising electric



A "Supreme" lighting fitting (L. G. Hawkins & Co.)

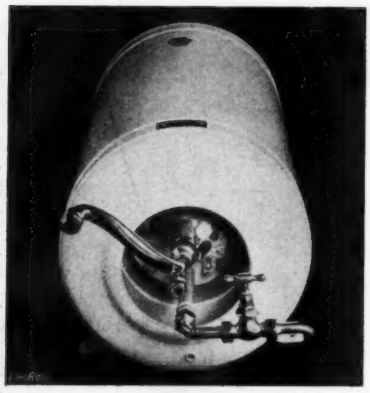
cigar lighter, table standard with tinted shade and switch, electric clock and ash tray are also displayed.

Heatrae, Ltd.

This exhibit is confined entirely to electric water heating apparatus. An illuminated centre piece containing four heaters discharging hot water into a sump is supplemented by typical examples of circulators and immersion heaters, together with large scale diagrams showing methods of applying the apparatus and running pipes.

A 20-gal. R.B.F. type floor cistern and a 12-gal. rectangular model are particularly designed for use in flats and small establishments. A 12-gal. B.H. type with control panel is suitable for artisans' dwellings where a constant hot water supply at the bath is not usually required. The loading is kept down to k kW. A useful combination of this heater and a 1½-gal. automatically controlled heater at the sink is diagrammatically shown.

There are also a heater specially designed for hairdressers; a typical example of the flat shape displacement type and the new type R.N.S. (illus.) which has a sub outlet. The last-mentioned is intended to work as a displacement type heater at the bath and as a gravity type heater for supply to a washbasin nearby for small houses. The "Heatrae Ace" is a horizontally arranged, automatically controlled immersion heater. Auto-circulators and immersion heaters of the tubular and



Heatrae combined displacement and gravity feed water heater, showing additional outlet

flat blade types and a group of warming plates are also shown.

Holophane, Ltd.

Among street lighting refractors and auto-photometers, the large circular lantern for a 400-W mercury discharge lamp is the most prominent. It has a smooth glass refractor and dome-shaped lantern top, and provides a two-way directional lighting distribution.

A square prismatic panel lantern can be used for 250-W and 400-W mercury discharge lamps, while the new sodium discharge lamps are catered for by a special prismatic panel lantern.

A series of double-skirted refractors, called "Duo-Dome," is made in three sizes for symmetrical light distribution all round. Also the two-way 180° axial type for centrally suspended units gives a high intensity up and down the roadway. For side mounting the two-way 150° type gives two-way distribution up and down the roadway and at a slight angle across the road. There are bowl refractors of various sizes and distributions, and a special pedestal type ornamental refractor which produces a wide fan-shaped lighting effect. The Holophane "Lumeter" and the Holophane-Edgcumbe auto-photometers include a new street lighting model of the latter.

Hoover, Ltd.

These suction cleaners include a beating-sweeping model, a two-speed machine, and the small "Dustette" for single-handed use. Besides the standard domestic models there is the lightweight "Junior" as well as a larger machine for hotels and similar premises.

Horticultural Section

In the exhibition grounds there is for the first time a co-operative display of electrical apparatus used in connection with horticulture and market gardening, such as Church soil-heating units and G.E.C. and Siemens cables for the same purpose; also G.E.C., Siemens and "Unity" tube heaters and thermostats; Church propagating frames, water-heating units and sprayers; G.E.C. and Siemens immersion heaters and G.E.C. plant irradiation equipment.

Horstmann Gear Co., Ltd.

Electric time switches cover automatic control for street lighting, shop windows

Solar compensating dial (Horstmann Gear Co.)

and sign lighting, multi-tariff metering, etc. They are supplied in 15, 21, or 40/42-day hand-wound models, synchronous motor drive, or electrically wound with reserve spring. Handset or solar dials (illus.), the latter fitted with longitudinal adjustment, are provided, with which any desired lighting or extinguishing schedule can be followed.

H.M.V. Household Appliances, Ltd.

Upon this company's stand refrigerator Model 54 is on view, also oil-seal frictionless refrigerant circulators, and examples of H.M.V. porcelain enamel work. Other exhibits illustrate fundamental engineering processes at the Hayes works.

Hotpoint-Electric Appliance Co., Ltd.

Beside standard current cookers, washing machines, immersion heaters, circulators, etc., there is a cooker specially constructed to rest upon the top of a refrigerator (illus.). Ninety of these are to be supplied to a block of flats in Gray's Inn Road. The cabinet is the base on top of which stand a separate oven and griller with "Torribar" boiling plates. The overall dimensions are 40 in. wide by 19 in. deep. The oven and grill chamber with hob are set side by side, the height from the floor to the hob being 38 inches. The oven is at hand level. The refrigerator to be used with the cooker in the flats mentioned is manufactured by the Coldair Co.

Another "Hotpoint" exhibit is a cooker, No. 6012, with a 1½-gal. water heater mounted immediately above the hob. With this arrangement the housewife can draw clean water for cooking

Hotpoint combined refrigerator and cooker

purposes without having to move her cooking utensils from the hob.

Jackson Electric Stove Co., Ltd.

Two new models have been added to the "90" series of cookers. Their design and construction are on the same principles as those of the "91J" cooker, but an extra 2 in. has been added to height and the oven, making it 12.75 in. The total loading of the "92J" cooker is 5,200 W, while the "93J" has an extra 6¼ in. diameter boiling plate, making a total loading of 6,200 W. All parts are interchangeable and the elements are fitted in the sides of the ovens.

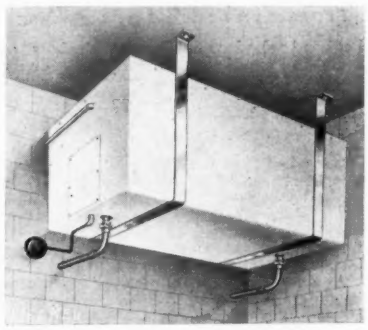
A new 10-gal. wash-boiler is square in shape, and can be used as a table. The white enamelled lid is easily removable. The interior is circular and has a circular lid in addition to the square lid. The finish of the outer case is in mottled grey vitreous enamel, with legs to match. The inner lid and container are of heavy gauge copper well tinned. Foot press switches are mounted at the front.

Portable electric fires and inset fires are shown in all sizes and in a wide variety of finishes. Domestic storage water heaters are also on view, together with a single unit of the chef's cooking range, which is so constructed that a number of units can be placed together to form an island range.

Johnson & Phillips, Ltd.

Only the latest "Charlton" electric storage water heaters are exhibited, the vertical cistern type being given prominence. In this design the cold feed enters a special heating chamber and gradually flows into the hot water storage container. The cold water is heated to the draw-off temperature en route. The heating elements are always surrounded by water and the whole of the hot water stored in the container can be exhausted without regard to the incoming rate of the cold flow. Vertical cistern type heaters are specially suitable for use in flats.

The shape and dimensions of the "Charlton" ceiling type heater (illus.) will recommend this design for installation where space is very limited, and



Ceiling-type water heater (Johnson & Phillips)

there are 1½-gal. heaters of both rectangular and cylindrical designs.

There is now a comprehensive range of J. & P. immersion heaters for fitting to new or existing water tanks. They are of the tubular pattern for vertical or horizontal fixing.

J. P. Tubular Heater Co., Ltd.

Tubular heaters are available in both rigid and flexible types; also ornamental radiators with loadings of from 2 to 4 kW. A connector is shown for the first time, which is arranged for half or full heat with an illumination effect produced through grills. For use in bathrooms tubular towel rails are made for wall and floor mounting, finished in nickel, chromium and pastel colours.

There are reflector fires, a 1.5-gal. rectangular tank water heater, and flexible immersion heaters.

Leda Electric, Ltd.

Fully automatic domestic electric refrigerators range from 2 cu. ft. upwards. Each model is fitted with a full complement of heavily tinned removable bar type shelves and ice-making equipment. The insulation consists of compressed corkboard and each model is mounted on 4 in. high feet.

The ice-cream cabinet is capable of producing 10 gal. of finished ice-cream per day. The cabinet is insulated with compressed corkboard, and all controls are located on a centralised panel. The whole is entirely portable, mounted on four solid rubber-tyred castors, and is operated by fully automatic units.

MacGregor & McCallum, Ltd.

The "Magic" electric washer is a sturdy seamless one-piece porcelain-enamelled tub accommodating 6 lb. of dry

clothes with a special vacuum cup action. Included with the washer is a cadmium - plated reversible electric wringer, and the "Filordrain," a simple device for filling the tub and draining it after use. All the mechanical parts are enclosed. The de luxe model is similar but has a tub holding 8 lb. of clothes.

The wringer post ironer which fits on to the washing machine in place of the wringer, has a roll 26 in. long, the loading being 1,150 W. The "Magic" table top ironer (illus.) is heated by means of a flat element stamped out of a solid piece of resistance metal. This, combined with the fact that the lead-in wire is an integral part of the element, eliminates burn-outs. Another refinement is dual control of the ironer by conveniently placed finger and knee controls. The loading is 1,150 W, and with the top closed the machine becomes a table, with the ironer completely enclosed.

The gyrator electric washer incorporates a gyrator made of moulded aluminium with beaded edges to protect clothes against wear or damage. It has

"Magic" electric table top ironer (MacGregor & McCallum)

a seamless porcelain-enamelled tub with a capacity of 7-8 lb. of dry clothes. The reversible electric wringer is adjustable to six different positions.

Manor Electric Oven & Fire Co.

New table type cookers are fitted with a plate heating cupboard above the oven and under the hob. Incorporated in the hob is a cast-iron type combined grill boiling plate of the company's own manufacture and either "Chromalox" or solid boiling plates can be fitted according to requirements.

The feature of reflector type panel fires, both portable and inset models, is that when the elements are switched off the reflectors retain the glowing appearance of element spirals. This effect is produced by a 60-W tubular flame-coloured lamp, the light from which is reflected through slots on to the back of the elements, which are consequently reflected in the reflectors.

Low temperature type portable heaters have their elements enclosed in artistic illuminated Doulton bowls, which are heat-resisting, and can be obtained in a range of colours.

Measurement, Ltd.

Apart from standard type "HM" quarterly d.c. and a full range of polyphase meters, the single-phase type "Z" quarterly meter is obtainable in a metal or bakelite casing.

Special attention is drawn to a new prepayment meter. It is contained in a robustly constructed bakelite casing. The base is suitable for either d.c. or a.c. meter elements, facilitating the work of conversion. The prepayment mechanism is suitable for shilling, sixpenny and penny coins, all being inserted in the same slot.

The new multi-coin prepayment meter has been designed in such a way that it can be supplied with, or subsequently fitted with, a step-rate unit or fixed charge collector with synchronous motor. A novel design has been incorporated for a quick and easy change of the price per kWh, which can be effected in steps of ½d. without removing the meter cover.

Metropolitan-Vickers Electrical Co., Ltd.

A new prepayment meter not only takes either shillings or pence, but also incorporates an automatic change gear which puts the consumer on to a cheaper power rate as soon as he has taken a predetermined quantity of electricity.

The type VA load limiter can be simply added to an ordinary circuit to prevent both the cooker and the water

Left: "Metrovick-Glen" type TC change-over relay. Centre: "Satchwell" room thermostat (Rheostatic Co.). Right: A Reyrolle earth-testing meter

heater being used simultaneously, thus effectively limiting the peak loads. Type TC relay (illus.) ensures that energy taken for lighting purposes is paid for at the lighting rate unless sufficient is taken to warrant a power rate.

A model of an ideal hob illustrates the use of "Metrovick" radiant type boiling plates in neon tubing. A separate flashing model clearly shows the way in which half the elements may be used for heating small vessels and simmering purposes. Several other cooker manufacturers in the exhibition include "Metrovick" plates as standard parts.

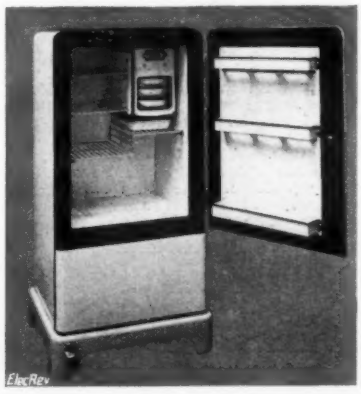
The entirely weatherproof "Trafolyte" material is suited for street nameplates, traffic signals, &c., as well as for a great variety of small labels.

"Cosmos" lamps are displayed and the "Decora" lamp for architectural strip-lighting is largely used to decorate and illuminate the stand. Recent floodlighting installations are illustrated and the latest type of discharge lamp is being demonstrated in a floodlight fitting.

Moffats, Ltd.

The new 45M cooker fitted with the "8 cook quick-speed plate" is shown, together with the de luxe M45 refrigerator. The latter (illus.) is finished in porcelain enamel, has toe-touch door release and automatic interior floodlight, and is streamline in design.

Coloured cookers are available in two-tone ivory, ivory and green, ivory and



The M45 refrigerator (Moffats, Ltd.)

crimson, ivory and jet black, in addition to French grey and white. The refrigerators match the cookers and are available in two-tone ivory and in white with French grey base.

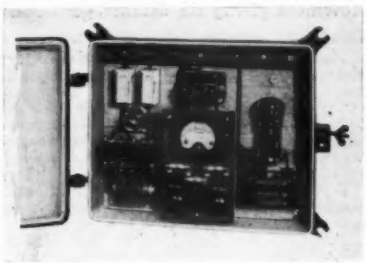
George Nobbs, Ltd.

Among representative samples of water heaters of different types, immersion heaters of both the blade (mica) and tubular (withdrawable refractory) types are to be seen in various sizes and loadings; also tank flanges for conversion sets, thermostats, and low-temperature electrically heated water radiators.

Radiovisor Parent, Ltd.

A device for the automatic control of street electric lighting by means of day-light intensity consists of a radiovisor bridge housed in a round casing with a window at the top for the admission of diffused light from the sky; the necessary auxiliary circuit employs a gas discharge tube.

An industrial smoke indicator (illus.) for flue gases in boiler uptakes and chimneys is also shown, together with



Radiovisor smoke indicator control box

apparatus designed for counting objects by passing them through a beam of light.

Revo Electric Co., Ltd.

This range of cookers is provided with super-speed grill, boiler, and boiling plate. There are also clothes washboilers, washing machines, tubular and panel heaters, and other domestic appliances, as well as street lighting lanterns for use with gaseous discharge lamps and "Magnalite" fittings.

A. Reyrolle & Co., Ltd.

Improved domestic water-heaters of 1½-, 3-, 5-, and 12-gal. sizes have a low surface rating of the elements, resulting in reduced scaling and longer life. The "Reymez" wash basin has a self-contained automatic storage heater in the pedestal.

Earth-leakage trip switches are a recent development to meet the new I.E.E. Regulations (10th Edition) in rural areas. A portable earth-testing unit (illus.) in addition to performing the usual continuity tests, will determine the exact impedance of the total earth-fault resistance-path on any a.c. system from a consumer's outlet, provided the sub-station neutral is earthed. By this means the ratings of sub-circuit fuses or circuit-breakers can be checked or set for adequate earth-fault protection.

The "Reyvaux" off-peak load-control unit comprises a contactor and a transformer-operated bimetal relay. The "Reylovolt" transformer provides a safe and convenient low-pressure supply for situations where a fault with normal supply-voltage might prove dangerous. Besides a 35-kW low-voltage electrode steam raiser there are high-voltage electrode water-heaters and steam-raisers and low-voltage electrode water-heaters; and various immersion heaters.

The "Reydome" ceiling radiator,

"Easigo" plugs and sockets, an all-insulated house-service fuse-box and switch, semi-enclosed and cartridge fuses are other items. "Eureka" vacuum cleaners are represented.

Rheostatic Co., Ltd.

Type "C.S." cooker thermostat for automatic electric oven control is shown. The "Satchwell" type "Q" room thermostat (illus. on page 827) gives close temperature control within plus or minus ½° F. Type "Y" immersion thermostat is similar in construction to the type "Z," and is intended for use in the smaller sizes of electric water heaters. Type "C.B." is a control box comprising motor starting relay, main switch and overload protection for control of small motors for automatic coal stokers, &c.

Santon, Ltd.

The thermal storage water heaters have been remodelled to improve outline, ease of access, general finish and performance. The merits of the circulator "Circ-Stat" for converting existing hot water systems in conjunction with thermostatic control are emphasised.

To the ordinary "San-Spray" model there has been added a similar heater designed for thermal storage (illus.). The advantage of this method of shower bathing is that an adjustable automatic cut-out determines the ultimate temperature of the water and a simple mixing device enables the bather to adjust the spray to produce any temperature desired. The "Soon-Hot" type in various sizes for serving one point is a modified design of the popular "York" heater. There is also an instantaneous geyser, a cylinder belt for converting existing cylinders to electric heating, and thermal insulating jackets of various patterns.

To this company's range of rotary switches has recently been added a new movement giving six definite positions.

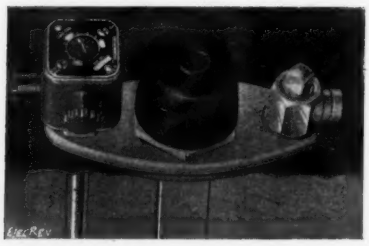
George H. Scholes & Co., Ltd.

The "Wylex" system provides interchangeability of plug outlets throughout the installation. Two three-pin (flat) plugs can be inserted simultaneously in one socket. The 5-A fuse-plug fits directly into a 15-A socket without an adaptor, but the 5-A socket will not admit a larger plug. The "Wylexion" two-pin B.S.S. plug and socket can be used without a switch on a.c. circuits.

Besides the fused plug for clocks, other accessories are ceiling roses, joint boxes for c.t.s. and lead-covered cables, a two-piece gland that is watertight and provides good bonding, a small plug and socket that enable pendant lighting fittings to be removed easily for cleaning, and the "Quix" device for easily attaching switches to the wooden door jamb instead of plugging the wall.

Siemens Electric Lamps & Supplies, Ltd.

A range of "Xcel" cookers embodies plug-in elements throughout. A large



Immersion heater (Siemens Electric Lamps & Supplies)

grill-boiler is fitted, and the hot chamber extends the whole width of the cooker. The boiling plates are of the cement type, or, alternatively, of the tube sheathed type, both being interchangeable.

Water heating storage tanks have copper containers, and all metal in contact with water is non-ferrous. Immersion heaters (illus.) complete with the "Xcel" easy fixing flange make a useful unit for the conversion of existing tanks; also tube heaters, with a simple form of multilink connector, together with a representative range of fires.

Besides the "Sieray" electric discharge lamp other Siemens lamps suitable for every lighting purpose are on view, and this company is carrying out the floodlighting of the Chine Hotel. The "Neonic" lettered sign lamp is another interesting exhibit, while cooker control switches and meters complete the display.

Simplex Electric Co., Ltd.

The new "Creda" cooker (illus.) has a high-speed long life boiling plate and a boiler-grill hob. The large grill chamber extends over the full width of the cooker and gives ample warming accommodation for dishes or food. The "fall-down" door (which is spring loaded to prevent breakage) is useful as a shelf rest when removing dishes from the warming chamber. There are no heat-

The latest type of Santon "San-Spray" and a Simplex "Creda R" cooker

ing elements inside the oven. The interior is solid welded, free of any open joints or holes, and is perfectly steam-tight. A new oven ventilating system is provided.

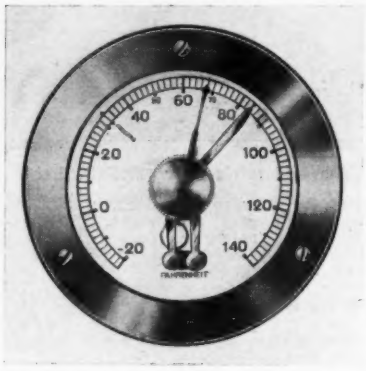
"Creda" domestic water heaters are of the non-pressure storage type with the control tap on the cold inlet, the hot outlet being permanently open and having an anti-drip device. Nichrome spiral elements in refractory formers are used and the "Satchwell" thermostats can be adapted for d.c. use by means of a simple attachment. A non-return valve can be fitted to prevent hot water entering the cold supply pipe during a possible fall in pressure, while a broken feed is used when direct connection to the water main is not permitted.

Stokes Appliances, Ltd.

This company's table cooker is a radiator which is inverted like a lid over an ordinary plate containing the food to be cooked. It can be used also for keeping food warm, toasting and heating purposes. The soldering iron is not of the usual poker type, but has a dual heating element and the bit can easily be adjusted to any angle.

Sun-Vic Controls, Ltd.

A display of thermostatic controls (illus.) operating in conjunction with their vacuum switchgear is of particular interest, since they operate without modification on a.c. or d.c. at high voltage and possess several other important advantages. The apparatus occupies very little space, and can be mounted in any position. The main contacts are *in vacuo*, and hence suffer no arcing damage. The control circuit is entirely



Sun-Vic "Rotothermostat"

non-inductive, thus enabling the switch to be operated by contact thermometers, voltmeters, or other instruments with perfect immunity from sparking at the control instrument contacts. Typical dial contact thermometers adapted for air and hot water temperatures are shown, operating in conjunction with vacuum switches. Other "Sun-Vic" products are vacuum thermostats, such as are used in heating pads and blankets, soil-heating cables, and glue pots.

Bertram Thomas

Heated food buffets of various sizes are available on wheels either as open wagons or glass-sided cupboards with a hot-plate top. Extra plugs are provided for kettles, toasters, etc., all served from a single connection to the mains. Three-heat control is provided with loadings of from 500 to 1,400 W.

The cylindrical plate warmer is portable and has a revolving shutter. With a loading of 500 W a dozen plates can be warmed in ten minutes. The plates are packed closely, but separated from each other by a spring device. "Tunnel" heaters have a small thermal capacity. The heat from the element is transferred quickly to the trough casing by the continuous circulation of air inside the "tunnel." They are loaded at from 60 to 240 W per foot run, a single steel casing being employed for each. Sectional and adjustable "Tiltrack" steel bins, shelving, and cabinets are also available.

Tricity Cookers, Ltd.

This display of domestic electric cooking utensils and appliances of various types includes several recent introductions, such as the new Jubilee series.

Unity Heating, Ltd.

Low-temperature automatic electric central heating equipment includes tubular heaters for fixing round skirtings, also under pews in churches or under seats in cinemas; flood heat radiators which are placed around walls somewhat in the manner of pictures; larger panel radiators for fixing upon walls or more generally upon ceilings; thermostatic switches for the automatic control of heating apparatus; and water heaters for fitting in bathrooms or over wash-basins.

There are also domestic appliances such as towel airers, linen cupboard heaters, and two new developments in the form of a skirting panel heater which may also be fixed upon the wall instead of the skirting, and a convector that con-

"Unity" convector with three-heat switching

sists of a thermostatically controlled air warmer of the cabinet type.

Venner Time Switches, Ltd.

This is a representative display of watt-hour meters, including various types of prepayment meters and a two-part tariff meter. In a varied selection of time switches are models for the control of street lighting, some driven by synchronous motors and others actuated by synchronous motors with spring storage to obviate stoppage in the event of the supply failing.

Power Supply Prospects. By W. B. Woodhouse, M.Inst.C.E., M.I.E.E.

Problems presented by process steam, surplus heat and electro-chemical works

WHEN electric power supply was initiated in this country about thirty-five years ago, it was foreseen that the advantages which the user would gain were two-fold; first, a saving of power resulting from the sub-division of the load and the elimination of wasteful mechanical transmission, and, secondly, a saving in the cost of power production due to the efficiency and advantages of centralised generation. But as the first advantage could be obtained by local electric power production, the question of public supply *versus* private power production came to be determined almost entirely by a consideration of relative cost and convenience.

The practical answer to the question is that in the last tweny-five years the use of electric power has increased four-fold, in the last seven it has doubled and, since the trade revival in 1933, there have been clear signs of an increased willingness on the part of the power user to take the public supply. This movement has been stimulated by the continuous fall in the price of electricity. Year by year the cost of generation has been reduced; an average coal consumption of 3.4 lb. per kWh in 1921 has to-day in the large generating stations been reduced to little more than 1 lb. Similarly the cost of distribution is falling as the use extends and in both generation and distribution we may confidently look for still further reductions of cost.

But this is not to say that the power supply engineer's task is over; there are yet problems to solve which require all the knowledge and all the goodwill that both the users of power and the producers of electricity can bring to the task. Of these, omitting that of the railways which is deserving of separate consideration, there are three important classes of power users who are compelled when making a decision to consider not only the price at which electricity can be bought but also other circumstances and costs of their business.

First are those such as paper makers and dyers who require process steam and who by the use of the pass-out turbine may secure substantial fuel economies. Next are those industries which produce surplus heat or other fuel such as ironworks and collieries, and thirdly those industries in which electric power is, so to speak, the principal raw material and who are in competition with electro-thermal or electro-chemical processes carried on in other countries by the aid of water power.

Left: A 5-ton electric furnace making alloy steel. Right: A 750-h.p. motor driving a rolling mill

The difficulties in the way of these industries making use of the public supply are being resolved as a result of the careful study of the circumstances of each case. The process steam user, it is found, does not in many cases obtain the apparent thermal advantage arising from the use of exhaust steam for heating because the power and the heating requirements are unbalanced and provision must be made for the occasional use of live steam; moreover, the power plant is usually small as compared with central stations and, both on the score of capital cost per kilowatt and relative efficiency, is at a considerable disadvantage.

Attention is therefore being directed to means of reducing the demands for heating purposes; in the modern dyehouse the fuel consumption is already much less than it was and the prospect of further reduction is a favourable one. A mid-way course which has been adopted in some cases is to operate the "power-heat" steam plant in conjunction with the public supply so as to balance the inevitable inequalities of demand.

On the other hand, the great reductions in the cost of generating electricity for public supply have made possible the consideration of schemes for off-peak supply for heat or steam production. This may become the most general solution.

Mr. W. B. Woodhouse is engineer and manager of the Yorkshire Electric Power Co.

The increment cost of the fuel required to generate additional "off-peak" energy in a large power station is very small and, with suitable means of controlling the use of the electricity and with provision for heat storage, a price as low as 0.15d. per kWh is possible, a figure at which heating by electricity is a practical commercial alternative to many local plants.

The industries which produce surplus heat as a by-product include ironworks and collieries in respect of whose coke ovens and blast furnaces close attention has been given to the primary problem of reducing the amount of the surplus. The reduction of the coke consumption in blast furnaces has already become a notable success. Moreover, both ironworks and coke ovens are finding more profitable markets for their surplus heat than for power produced thereby.

The use of coke-oven gas to supply gas works has largely increased, and in some parts of the country such as South Yorkshire, is being conducted on a considerable scale. By co-operation with the various processes of steel making blast furnaces, whilst still using nearly three times as much coke as is necessary to provide the heat for smelting, have found an economical use for this heat almost in proportion to its production and the notable contracts for electric power which steelworks have made in the last few years indicate clearly that the industry is becoming more and more a user of the public supply. Moreover, the electric furnace is taking a more important place and we may yet see, by the aid of cheap electricity, a revolution brought about in methods of steel production.

The colliery problem still presents difficulties which have

been intensified by the depression from which the industry is suffering. Demands for coal have fallen more rapidly than the cost of production and the inclination on the part of coal owners to burn their own coal is a natural consequence of the difficulties of marketing it to the desired extent.

The relationship of the electricity supply industry to that of coal mining is essentially that of a distributor to a producer and the best interests of both will be served by co-operation. For the moment, unfortunately, some of their spokesmen choose to regard both electricity and gas distributors as opponents, and favour a policy of opposition to these utilities; the longer and sounder view would seem to be that the prosperity of the mining industry depends on the encouragement of the distribution of the energy of coal in every form and not only in that of raw coal.

The desired co-operation must take into account that the annual consumption of coal at the coal mines for power purposes is approximately equal to the total consumption by the electricity supply industry. But the prospect is by no means unfavourable because of the great economies which centralised generation can secure.

The " power station at the pit mouth " has always attracted supporters, but as a substantial contribution to the means of electricity supply it is not likely to affect the present policy of centralisation. Its claim for justification is that fuel is available at the pit of a quality which is either unsaleable or too cheap to justify the cost of transport. But this does not necessarily justify the establishment of a relatively small power plant on what may be an unsuitable site—a plant which perforce is operated without that degree of skilled control which a large station can afford.

Colliery owners are more and more devoting their attention to methods of cleaning and selecting coal so that none may be regarded as unsaleable, and there is little doubt that in due course this description will cease to apply; moreover, having regard to the high ash content of low-grade fuels, it may be that distillation will prove a more profitable mode of use.

The final outcome of centralised production of power does not seem in doubt, but the colliery problem of the moment is not too easy. The cost of changing the present steam winding and other engines to electric motors would be a heavy charge on a depressed industry and although the change is going on slowly, there is justification in some instances for the production of electricity at the pit in conjunction with the public supply.

The last important class of user to be secured as a customer for electricity includes those industries whose competitors in other countries are dependent on water power. The cost of hydro-electric power is almost entirely a fixed charge per kilowatt-year irrespective of the hours of use; the running charge as compared with that of a thermo-electric station has been relatively small but the difference is becoming less as time goes on.

Whether in any particular industry which employs large amounts of power for furnaces or electro-chemical processes it is necessary to have a continuous supply of electricity or practicable to utilise an " off-peak " supply will have an important influence on the cost of electricity.

The study of such industrial processes coupled with the consideration of means of applying stored heat holds out a promise that arrangements can be made on terms which will enable the products of some of these industries to be made in this country at a really competitive price.

Finally, a quotation from my May Lecture to the Institute of Metals in 1931 may be emphasised: " All these developments can be hastened by an increased use of the public supply of electricity by existing industrial interests generally, and much depends on the extent to which they are now prepared to co-operate in forwarding the scheme in the interests of future economies."

The Heat Insulation of Storage Tanks. By E. Chisholm

Possible economies to be effected

RECENTLY considerable attention has been paid to the heat insulation (or lagging) of hot water storage tanks, it being realised that if the standing losses from radiation are kept to the minimum the immersion heater installation can be recommended as an economical proposition to domestic consumers.

For one form of test of heat resisting materials employed at the National Physical Laboratory a sample of the material is placed in two frames, one on each side of a hot plate and surrounded by a guard ring, the whole then being clamped between two cold plates maintained at a constant temperature by water circulation. The temperatures of the hot and cold faces are measured by means of thermo-couples attached to various positions on their surfaces, the heat input to the hot plate being obtained by observation of the watts dissipated in its heating coil.

The thermal conductivity of the material is usually expressed in B.th.u. per sq. ft. per hr. for one inch thickness and for one deg. F. difference in temperature. Results of tests supplied by the Bureau of Standards in its letter circular No. 227 are as follow: Kapok, 0.24; Cabot quilt, 0.25; hair felt, 0.25; glass wool, 0.29; Balsa wood, 0.33; and sawdust, 0.42.

A Good Material

One of the finest heat insulating materials, cork wool, has a conductivity factor of 0.20 B.th.u. when packed to a density of approximately 2.5 lb. per cu. ft. Cork wool derives its exceptional heat-insulating properties from the air pockets entrapped when the material is packed to the above density, and also to the nature of the cork itself.

If the conductivity factor of the material is known, as well as the size of the hot water storage tank, a very close approximation can be arrived at as to the probable radiation losses which will be encountered on the completed installation. Before adopting an unknown method one would be well advised to inquire about the conductivity factor of the material in question, or to take a practical test over a definite period for radiation losses. Some materials which are eminently suitable for the lagging of high-temperature boilers and steam pipes are not suitable (when radiation losses have to be kept to the minimum) for lagging hot water storage tanks on electrical conversion jobs where comparatively low temperatures are encountered, the maximum temperature probably being in the neighbourhood of 180 deg. F.

The two sizes of domestic hot water tanks most commonly used are the 25-gal. type in the south of England, and the 40-gal. cylinder in the north. In conversions to electric heating it is usually possible to provide two inches of heat insulation. With this thickness of lagging additional heat conservation resulting from the use of cork wool as against other insulating materials (granulated cork, &c.) is 0.05 B.th.u. per sq. ft. per hour, per deg. F. The saving which can be effected is shown in the following example.

Amount of Electricity Saved

A 25-gal. rectangular tank has an aggregate surface area of approximately 15.8 sq. ft. With a storage water temperature of 175 deg. F. and an ambient temperature of 65 deg. F. the temperature difference is 110 deg. F. The additional heat saved by the use of cork wool is thus $15.8 \times 110 \times 0.05 = 86.9$ B.th.u. per hour. In a year the saving amounts to $86.9 \times 8{,}760 = 761{,}244$ B.th.u., corresponding to the consumption of 223 kWh of electricity.

A 40-gal. cylindrical tank has a total surface area of approximately 20 sq. ft. Consequently with 110 deg. F. temperature difference the heat economy is $20 \times 110 \times 0.05 = 110$ B.th.u. per hour. This becomes 963,600 B.th.u. or 294 kWh of electricity per annum.

These economies result from what is superficially a small reduction in the hourly rate of heat loss. This may surprise those who have not hitherto given the matter detailed consideration. Actually the economies shown are under-estimated rather than exaggerated. While the figures given above are minimum values, it should be realised that they recur year after year.

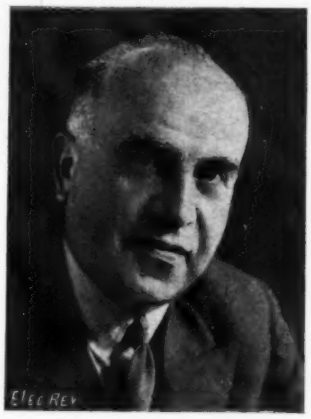
If materials with a conductivity factor inferior to that of granulated cork are considered the advantages of cork wool become even more striking. One such material which is sometimes used for heat insulation on electric immersion heater installations is ordinary corrugated paper, which has a conductivity factor of 0.436 B.th.u. Compared with it cork wool will effect the following savings in energy consumption: Under conditions as case (1), 496 kWh per annum; and under conditions as case (2), 666 kWh per annum.

From my own experience I have found that with cork wool heat insulation on 25-gal. tanks in the south of England, the total radiation loss on a complete water heating installation with unlagged copper piping to feed the bath, lavatory basin and kitchen sink can usually be kept within 2 kWh per day, or approximately 730 kWh per year. At ¼d. per kWh this figure represents £1 10s. 5d., which may sound in itself considerable, but it should be borne in mind that a certain amount of this consumption should be allowed to off-set the cost of keeping the linen cupboard at a high temperature for the airing of clothes. This particularly applies to the metallic head of the immersion heater and thermostat, and also to the expansion or vent pipe which usually runs through the length of the linen cupboard.

The Development of Distribution. By L. Romero, M.I.E.E.

DURING a working experience that has been almost co-extensive with the twentieth century, I have seen great changes in the practice of the distribution of electricity, but that extremely reliable conductor of electricity, the paper-insulated lead-covered cable, still reigns supreme.

The organisation of electricity supply on a local basis involved the formation of hundreds of independent and disconnected supply undertakings, and this state of affairs, while not conducive to standardisation of practice, does certainly provide the best conditions for the trying out of individual ideas and schemes, many of which, and some of them valuable, would be smothered at birth under a centralised system of control. In the long view there seems little doubt that local control has on the whole been salutary for the sound development of electricity supply. If I may draw a parallel with Darwin's theory I would say that the large number of independent supply undertakings provides the means for many variations to occur and receive trial, and that natural selection operating on these variations ensures that, broadly speaking, only the fittest are allowed to survive.



[Lafayette

Mr. L. Romero is engineer and manager of the Salford Electricity Department

It is perhaps in the selling of electricity and in the development of hiring of appliances, rather than in the actual distribution of electricity itself, that the most valuable experimenting on individual lines has been carried out, but as this article is concerned with distribution practice, I cannot now stray into that interesting and controversial field.

I may say, however, that I am firmly convinced that electricity is destined to supersede all other methods of cooking, water heating and intermittent room heating within the relatively near future and that in ten years from now, or possibly less, the consumption of electricity in domestic premises will considerably exceed the industrial consumption.

Uniformity of Systems

What, then, are the lines along which practice in distribution is likely to develop in this country during the next decade or two? The one thing which is obviously most urgently needed is complete standardisation of voltage and system of supply throughout the country, so that consumers moving from one locality to another may be able to take their appliances with them and use them without alteration in their new homes, and so that manufacturers and distributors of electrical appliances may have to produce and handle only 230-V 50-cycle goods.

The paper which I presented at the I.M.E.A. Convention in Liverpool last year, revealed that although excellent progress was being made in the change-over from d.c. to a.c., which should be practically completed in the early future, very unsatisfactory progress was being made in the adoption of the standard voltage. Of the fifty-two large municipal undertakings which gave information, fourteen had always had standard voltage, three had completed their change to standard, thirteen were changing to standard (two on part of their systems only), four were adopting standard for new networks only, and eighteen were maintaining and extending non-standard voltages throughout their supply areas.

If the twenty-four large municipal undertakings, and the no doubt much greater number of company and small municipal undertakings, which are not adopting standard voltage throughout their whole systems cannot be persuaded to do so, the hands of those who are pleading that local control should be abolished in favour of centralised control will be greatly strengthened. If, however, 230 V 50 cycles can be adopted throughout the country, and a reasonable degree of standardisation brought about in certain other less essential matters, then I can see no appreciable advantage from the distribution point of view in adopting national control; in fact there may be certain rather grave disadvantages.

However, whether distribution is destined to operate in the future under local or under national control, practice will probably tend to develop somewhat along the following lines:—Low-voltage networks will be three-phase four-wire at 400/230 V. As the load density grows network sub-stations will multiply, which will mean that distribution will be done more and more at high voltage and that the length of low-voltage distributors will decrease, with beneficial effects on regulation at the consumers' terminals. The high-voltage supply to network sub-stations in most general use is 6.6 kV, which will probably come to be regarded in time as standard.

In the larger undertakings in which an additional higher main transmission voltage is necessary, 33 kV has been adopted in the great majority of cases in recent years, and it may be anticipated that it will become standard for this purpose, although 66 kV is also being used in a few of the largest undertakings. The use of l.v. high-rupturing capacity cartridge fuses (and not oil switches) for outgoing mains will become standard in network sub-stations. The number of sizes of four-core l.v. distributor cables will be greatly reduced. I suggest that 0.25 sq. in. and 0.125 sq. in. would be suitable and sufficient for most requirements. It is already standard practice to lay these l.v. distributor cables direct in the ground, and there is a tendency to dispense either with armour, or with warning tiles, for the sake of economy.

The practice of laying only a two-wire service to domestic premises whatever the loading, already widely adopted, will become standard except for very large houses. All-insulated house-service fuse boxes and meters will become standard practice, as metal cases are undesirable and a possible source of danger, whether they are earthed or not.

L.v. networks covering large areas will be interconnected, probably with fuses, so as to make the fullest use of the copper installed. In l.v. network sub-stations it seems probable that the practice of installing only one transformer will become more general as the interconnection of l.v. networks between sub-stations is more widely adopted.

Transformer Standardisation

A very large number of different capacities of transformers is now in use in network sub-stations in the various undertakings. I would suggest that for urban and suburban areas most of these sizes are unnecessary and that standardisation at, say, 250, 500 and 1,000 kVA would provide adequately for all but very exceptional cases. It is desirable also that something should be done towards standardising winding ratio, impedance and tappings on network transformers.

In single-transformer network sub-stations which, as suggested above, are likely to become the standard type, the method of transformer protection generally adopted is overload with the time limit fuses and instantaneous earth leakage on the h.v. side. This is a simple and satisfactory means of protection for a transformer feeding a separate network, but with the introduction of wide interconnection of l.v. networks between sub-stations, an oil switch with reverse-power trip or Merz-Price protection will become necessary on the l.v. side of the transformer if supply is to be maintained to all consumers on the occurrence of a transformer fault.

The use of a h.v. main transmission feeder and step-down transformer at the sub-station end, as one unit for switching and protection, seems likely to become standard practice in all cases where the conditions are suitable, that is to say where the 33-kV supply terminates at the sub-station and is not carried on therefrom to other sub-stations. The adoption of this arrangement enables all 33-kV switchgear at the sub-station end to be dispensed with, effecting heavy savings both in first cost and in maintenance. On 6.6-kV and 11-kV ring mains the usual method of protection is, and will probably continue to be, overload and earth-leakage with graded time limits where necessary. On important parallel feeders some form of balanced protection with pilot wires will probably be the standard.

Close voltage regulation at all times at all consumers' terminals should be one of the chief concerns of the distribution engineer. I believe that in urban and suburban areas, 2 per cent. variation either way will come to be regarded as normal good practice within the next few years. The value of electricity supply to the consumer is very much enhanced by close voltage regulation.

It is hardly to be expected that my forecasts will prove correct in every respect, but they are based not only on long personal experience but also and very largely on the unique information which I was able to gather from all the large municipal undertakings in the country when preparing my paper on "Present-day Practice in A.C. Urban Distribution" for the I.M.E.A. Conference last year.

Finally, I would like to say again with the greatest possible emphasis that I consider the question of the general adoption of standard voltage to be the most important and urgent one with which the supply industry has to deal to-day. I appeal to all those who have not yet taken action to do so before the power of action is taken from them.

Electric Cookers. By E. A. Mills

Points for manufacturers

THE design and construction of electric cookers is from time to time the subject of much criticism, but many suggestions made to effect improvements are, very frequently, not only impracticable, but overlook some of the fundamental factors involved, such as demand and cost of production.

The modern electric cooker is a reliable, efficient, and labour-saving piece of apparatus, and compares most favourably with any other type of cooker. Unfortunately prejudice exists in the minds of many of the public which can only be overcome by propaganda, demonstrations, and a willingness on the part of every supply authority to see that every consumer using an electric cooker receives the best possible service. The doubters have to be convinced that an electric cooker is not only simple in use, but that it fulfils the requirements of the most accomplished chef or the most hypercritical housewife.

Improvements which have been made in the design of electric cookers are reflected in reduced maintenance costs and greater reliability, but there are a number of details which might be the subject of investigation with a view to obtaining some degree of uniformity which must ultimately reduce the cost of production. The use of acid-resisting vitreous enamel has helped very considerably to extend the life of the electric cooker. It is, however, unfortunate that a number of manufacturers continue to employ an enamel which will not resist the ordinary acids present in certain foods.

The request is frequently made for varying colour finishes. The manufacturers are ready and willing to provide almost any finish, but my experience is that plain coloured hobs are not so satisfactory as the mottled finished hob.

Heights and Sizes

Suggestions have been made that electric cookers should be constructed so that the position of the oven is placed more conveniently so as to avoid stooping, but it should not be overlooked that the space available in the modern kitchen (and in some of the older kitchens) is so very limited that it does not appear possible to meet this requirement. The table type of cooker which is used in large numbers in America and Canada, and obtainable at an attractive price, fulfils this requirement and is available in this country, but owing to the very limited number of kitchens in which this type of cooker can be accommodated the demand is small; the price, moreover, is higher.

The height of the ordinary cooker varies with different manufacturers; the suggestion is made that this dimension might be standardised as well as the vertical dimensions of the oven and hot cupboard. I would prefer the vertical dimension of the oven of the smallest sized cooker (excluding, of course, the small breakfast cooker) to be at least 14 in. instead of the 11 in. to 12½ in. which is usual. It is perhaps difficult to recommend standardisation of the other dimensions of the oven as circumstances very frequently make this impossible. For instance, at least one undertaking has been compelled to provide a cooker with a hob not exceeding 17 in. square in order to accommodate a cooker of any kind in the limited space available in the small houses in its area.

The variety of designs of splash plates and plate racks might be reduced with advantage. Consumers generally do not consider the latter to be of much practical use except as a place on which to put cooking utensils when not in use; it is not satisfactory as a plate warmer, and in many modern houses there is no room for it. Some manufacturers might give attention to improving the outline of their cookers with a view to removing dirt-collecting ledges; by no doing they would probably effect a saving in manufacturing costs.

Oven Construction and Ventilation

Several manufacturers have adopted the detachable oven and submit as an argument in its favour that it enables the user to remove it for cleaning. Not one in a hundred consumers does this, and I believe that the fewer parts the user can remove the better. There is much to be said in favour of the fixed oven. It avoids the necessity of a second casing to hold the lagging, but necessitates the use of plug-in elements located inside the oven. I favour this type of element owing to its reliability and efficiency.

The necessity for a permanent vent at the rear of the oven appears to be questionable as it increases the cost of production and leaves a stain on the wall behind the cooker; further, it does not seem consistent with economy to allow useful heat to escape and thus to increase the time taken to heat up the cooker. Is it not possible to determine the best means of providing ventilation in the oven and for all manufacturers to adopt the same method?

[*Lafayette*

Mr. E. A. Mills, M.I.E.E., M.I.Mech.E., A.M.Inst.C.E., is borough electrical engineer at Hackney

Some recent tests made to compare thermometer readings on a number of cookers supplied by different manufacturers gave widely varying results, and it was found that the length and type of guard over the thermometer bulb was one of the causes. Steps should be taken to standardise the thermometers used in electric cookers with a view to remedying this defect. The manufacturers' attention might with advantage be directed to the desirability of ensuring that the loading of the oven element should enable a temperature of, say, 400 deg. F. to be obtained in fifteen to seventeen minutes.

Automatic control of the oven temperature is a comparatively recent feature in connection with electric cookers which will probably become a standard attachment. It not only controls the temperature required for cooking purposes but is also a safeguard against the run-away temperature of the oven being reached and is also a compensator for voltage variations.

Generally grill and grill-boiler dimensions are too small, and vary in almost every make of cooker. It should be possible to obtain some degree of standardisation of this detail, both as regards dimensions and the distance of the grill tin from the radiant surface of the element. An improvement should be possible in the efficiency of the grill-boiler so that when the grill is in use boiling water can be obtained at a more rapid rate than at present.

The Hot-plate Question

Attempts are now being made to provide a more convenient means of simmering to meet demands of some users of electric cookers who find it difficult to simmer on the existing hot plates. A simple method of dealing with this difficulty is to insert a flat-wire mesh grid between the utensil and the hot plate. This may appear crude, but it is cheaper than any further complication to the hot plate, and is not likely to get out of order.

Hot plates and grill-boilers definitely tend to be of the plug-in type which helps to reduce the time spent at a consumer's premises in effecting repairs—a very important detail. There is, however, still a wide variety of cradles, all for the same fundamental purpose of shielding connections from mechanical damage and preventing short circuiting. It is essential that the under-hob assembly should be finished in vitreous enamel.

Whilst all cookers are provided with a main earthing terminal, the provisions made by several manufacturers for earthing the essential parts of the cooker leave much to be desired, badly fitting contacts and inefficient bonding being the chief causes for complaint. It is an important detail which requires greater attention, more especially when a cooker is vitreous enamelled all over.

Considerable progress has been made with the solid type of hot plate, both as regards reliability and speed of boiling, and this unit is rapidly approaching the maximum utility which may be expected from the materials at the designers' disposal. The radiant-type plate is that most preferred by consumers; the effect is probably psychological—the consumer desires to see something glowing. The low-voltage plate meets with this requirement but has the disadvantage that it involves an increased rental when cookers are offered on simple-hire terms. It is a matter for investigation whether the cost would be materially affected if the whole of the cooker elements were arranged to operate at the low voltage instead of providing only one hot plate so arranged.

Correlated with the manufacturers' efforts to meet consumers' requirements in the development of electric cooking are those of the supply authorities. Competitive tariffs and attractive simple-hire and hire-purchase schemes are available from most undertakings, but these alone are not sufficient to ensure steady development of the load. Publicity, salesmanship and demonstration (coupled with efficient service to every consumer) are imperative if success is to be achieved. The report on the development of domestic cooking by the Electric Cooking Committee (of which the president of the National Convention is chairman) issued by E.D.A. contains many helpful suggestions in this connection.

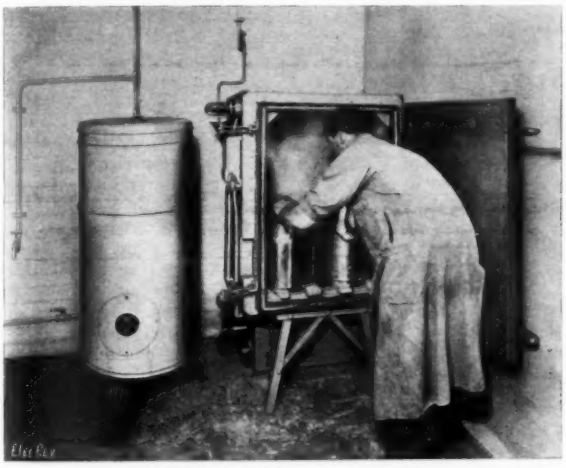
Dairy Farming

By F. E. Rowland, A.M.I.E.E.

DAIRY farming is an important branch of the agricultural industry, with an output estimated at £52,000,000 in England and Wales during 1932-33, in which the advantages of electricity are of particular value.

Thus, electric lighting enables milking sheds and dairies to be effectively illuminated, expediting work and enabling spillage to be avoided, whilst the absence of contaminating fumes alone warrants the adoption of electricity in many instances. Morning milking takes place at a very early hour and, in winter, when electric light and power are installed, work can be started without delay. The milk yield of a dairy herd may be largely influenced by the water supply, consequently the ease with which an ample service is obtainable from a small electric pump may be of great value.

It is sometimes advocated that the drinking water of cattle should be warmed in winter so as to conserve the animals' body heat. A report on a three years' trial conducted at the Caldwell sub-station of the Idaho Agricultural Experiment



A sterilising chest

Station shows that for fattening steers watered with warm water there was an increase in weight of 8.9 lb. per head. This was accompanied by a saving of 33.9 lb. of hay, 29 lb. of silage and 16 lb. of barley for each 100 lb. gain in weight during the fattening period.

Milking Machines

In New Zealand alone there are over 20,000 milking machines installed, and in this country there are several thousands giving satisfactory service, some of the prize herds which have won the highest awards in the dairy world being milked mechanically. Reference is sometimes made to "electric milking machines," but this description is not really accurate, because operation is essentially mechanical, although electric motors are frequently used for driving the vacuum pumps which draw off the milk and work the pulsators controlling the action in the teat cups. With small self-contained and portable machines an integral electric motor of about ¼ h.p. may be fitted.

In one machine the pulsators are magnetically operated. Current is furnished by a 9-V generator driven from the vacuum pump, to which a cam-operated make-and-break is fitted for providing the impulses to work the pulsators. By this means the use of a comparatively high voltage in the milking machine is avoided and current is provided on farms where electricity is not otherwise available. The pulsators contain an electro-magnet which raises a steel disc when the circuit is made. When the circuit is broken the disc drops due to suction, and in this way a regular and definite milking action is obtained. An ingenious feature of the equipment is that the current is led to the pulsators on top of the milking pails through conductors embedded in the rubber hose, which connects the milking pails to the vacuum line, contact being effected at either end by means of metal ferrules.

Among the principal advantages claimed for this method of operation are that all the pulsators work uniformly at all times; consequently there is no variation during different milkings and the cows always receive the same treatment, whilst the horse power is less than that required with vacuum-operated pulsators.

[*Fox Photos.*

Mr. F. E. Rowland is manager of the Agricultural Department of the General Electric Co., Ltd.

A milking installation installed at the Walker Gordon Farm, Plainsbro, New Jersey, consists of a large revolving platform on which there is accommodation for fifty cows, each in its separate stall with a milking machine unit. The platform revolves once in 12½ minutes, during which time fifty cows are milked. The cows walk on to the platform and enter a stall, and as the platform revolves they pass men who in turn wash them down and fit the milking machines. No fewer than 1,500 cows are milked by this plant three times a day.

Some comparisons between hand and machine milking, showing some of the advantages which accrue with the latter, are given below :—

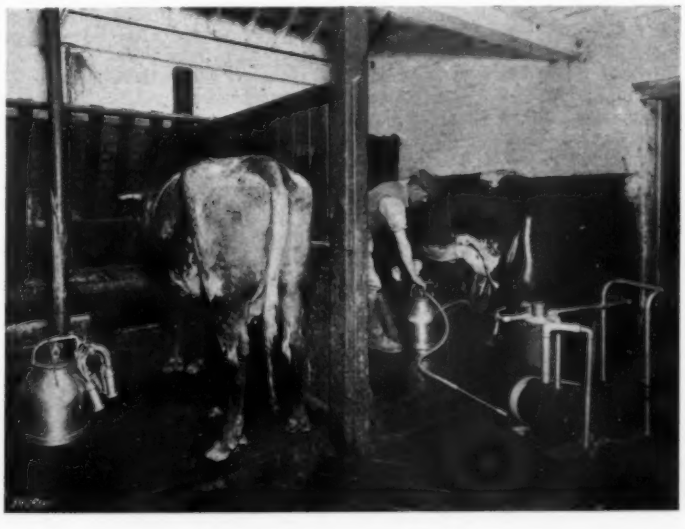
No. of Milking Units.	No. of Cows.	Time. Hours.	Men.		Remarks.
			Machine.	Hand.	
10	122	1¼	7	11	Cleaning machine ½ hour daily. ½ day for dismantling once or twice per week.
10	130	1¼–1½	4 men 2 boys	14–15	—
9	90	2½	3	6	140 gallons Grade "A" (T.T.). Cleaning as above.
7	80	1¼	4	9	—
5–6	60	1½	3 youths	—	Minimum daily yield 150 gals. Some cows milked for two years.

Irradiating and Sterilising Milk

Research work has been carried out in several countries on the effect of irradiating milk with ultra-violet rays. It is claimed that not only are harmful bacteria destroyed by this process, but that valuable properties are imparted to the milk resulting in an appreciable increase in the vitamin D content.

Advocates of this process claim that the anti-rachitic properties of vitamin D are more easily assimilated in this form than in any other, and that the health of children suffering from rickets has improved remarkably by giving them irradiated milk.

To produce high-grade milk it is essential to sterilise all



Milking cows electrically

utensils, such as pails, pans, milk coolers and bottles, with which the milk comes in contact. The Accredited Producers' Scheme, which came into force on May 1st, enables farmers to obtain a premium of a penny per gallon on milk produced

to a specified standard of purity, to attain which sterilising is essential. To sterilise the utensils effectively they should be steamed in an enclosed chest, as this is the only certain means of destroying bacteria. The process is completed when a temperature of 210 deg. F. has been maintained for ten minutes or when 212 deg. F. is reached.

There are two methods of steam sterilising electrically, the one employing a self-contained chest with built-in electric steam-raising equipment, and the other a separate boiler. Self-contained chests have the advantage of being compact and occupying only the space required for the chest, and as there are no external pipes or steam connections, heating efficiency is high. The low loading of these chests is evident from the following table :—

Internal Dimensions.			Capacity.	Loading.
Width.	Height.	Depth.		
ft.	ft.	ft.	cu. ft.	kW.
2	3	2	12	4
3	3	3	27	6
3	4	4	48	8
3	5	5	75	12

Tests made with a 3 ft. by 4 ft. by 4 ft. chest loaded at 8 kW show the times taken for sterilising utensils and bottles, and are typical of the performance for this operation. Test I was upon a chest full of tinned steel utensils (pails, coolers, cans, &c.); and Test II was upon a chest full of pint bottles (approximate capacity 500 bottles).

	Test I.	Test II.
Time taken to raise steam from cold	14 min.	14 min.
Time taken to raise temperature from cold to 210 deg. F.	56 min.	86 min.
Time taken to raise temperature from cold to 212 deg. F.	60 min.	90 min.
Cost per operation at 1d. per kWh.	8d.	1/-
Cost of sterilising per week, twice daily, at 1d. per kWh.	9/4	14/-

The time of operation may be shortened by preheating the water either in the chest or in an external water heater. With the latter there will be greater economy when a low tariff for water heating exists. Separate boilers may be used when steam is required for other purposes besides sterilising, and may be either of the electrode or immersion-heater type, the latter being most suitable for small installations. In dairies electric heating may also be used for water, small batch pasteurisers, cream scalders, and similar equipment.

Sub-station Earthing. By F. A. Ellis

Experience with various types of electrode

A CONSIDERABLE amount of experimental and research work has been carried out during the last two or three years, with a view to investigating the question of what type or types of earth electrodes should be recommended for given conditions of earthing. The subject has been considerably ventilated in the technical Press of late, largely due to the issue of the Tenth Edition of the I.E.E. Wiring Regulations, in which particular stress is laid upon adequate earthing facilities and earth-leakage trips.

The topic of earthing and earth electrodes for sub-stations is one that can produce the most convincing data, and early legislation may be reasonably predicted. The British Electrical and Allied Industries Research Association has gone into the matter thoroughly, and has published technical reports on the " Measurement of the Resistance of Earth Electrodes " and " Earth Current Voltage Gradients around Sub-stations."

Attention should be paid to No. 4 of the Commissioners' Regulations, 1934, which deals with multiple earthing and is therefore particularly applicable to the underground low-voltage distribution networks in towns, as distinct from those in rural areas, owing to the number of points at which these can be or have been interconnected at overground or underground section link boxes or pillars. Such interconnection is desirable in the interests of continuity of supply.

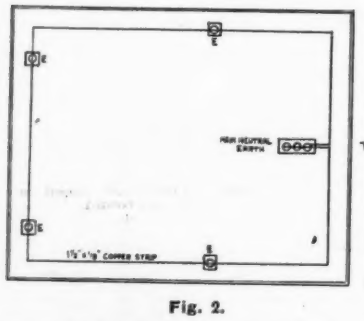


Fig. 2.

Reference to fig. 1 will show that multiple earthing is obtained under the simplest form of interconnection and is often, perhaps, carried out inadvertently. It should not, however, be assumed that by so doing advantage is being derived from the equivalent of a long horizontal earth strip provided by the cables. The bonding of the lead and armouring of cables to the main neutral earths will improve the return between these points, but the extent to which the general earthing conditions are improved will depend largely on whether or no the cables are served overall and on the condition of the serving. Inquiries have shown that the serving of cables is often assumed to deteriorate completely, but it should not do so with compound serving, especially where cables are laid direct in soil having no sulphur content.

The types of earth electrodes in use to-day can be set out as follows :—Plates : Cast-iron or steel, natural or galvanised; pipes : iron, steel or copper, natural, galvanised and/or tinned; rods : steel or special section copper; cones : copper with charcoal; and strip : copper or steel, plain galvanised or tinned. Plates, pipes and cones are generally buried in excavated ground with or without coke—salt being added to the coke from time to time in the case of pipes having inspection

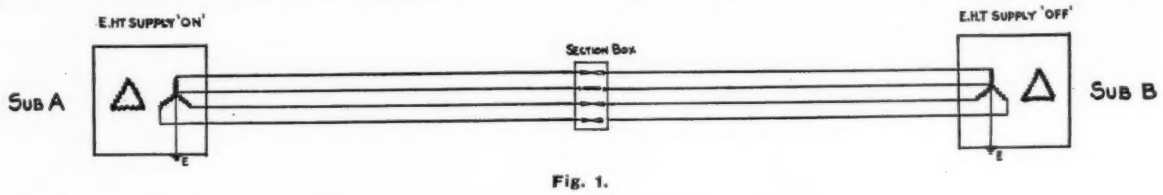


Fig. 1.

slabs. Rods are generally of the driven-solid variety, whereas strip has to be laid in excavated ground.

Plate electrodes are buried generally between six and eight feet deep, as often as not with a coke surround, with a stranded-copper conductor sweated into a lug attached to the plate by a dowel pin or bolted. If this connection at the plate is not properly bitumastic-compounded before filling in, it is probable that the connection will be completely corroded or sulphated away after a time. It has been proved that coke cannot be relied upon, as a great deal depends on the mesh and firing temperatures during coking, and during the earlier stages of the reaction set up between the coke and the surface of the plate, a gas film can be produced sufficient to form a partial insulating medium; the same applies to coke surrounding a buried pipe.

It was partly due to the trouble experienced with the connections between plates and pipes and the earthing leads, that the Electrical Inspector of Factories issued a memorandum in the form of a letter, some time ago, recommending, in lieu of plates, the use of pipe electrodes with flanges at the top to be kept above the level of the coke surround, and of a removable cover or slab over the connection between the earthing lead and the flange for testing, inspection and watering.

Special section copper rods are now obtainable for driving in solid which give an increased area of contact compared with circular rods or pipes. It is difficult to drive the latter to the required depths in very hard ground and Mr. H. G. Taylor, of the Research Association, has stated recently that " at a depth of about four feet the rods ran into stony or gravelly soil and the increased resistance to driving caused lateral vibration of the rods and so opened out the hole in the upper low-resistivity soil."

This brings us to the question as to whether it is better to bury deeply a plate or large-diameter pipe, to drive a circular small diameter pipe or special section rod, to lay a horizontal strip or stranded conductor in a shallow trench, or to bury multi-plate electrodes close to the surface. The tests in Table

I indicate that earthing fairly close to the surface yields the best results.

TABLE 1

Village.	Soil.	Test No. 1 (a) Ohms.	Test No. 2 (b) Ohms.
A.	Ironstone ...	8.5	2.6
B.	Blue clay (wet) ...	6.0	2.0
C.	Ironstone (damp) ...	11.0	4.0
D.	Shale (dry) ...	19.0	4.0
E.	Blue clay (wet) ...	40.0	6.0
F.	Ironstone (wet) ...	20.0	2.2 (c)
G.	Rock ...	50.0	0.2 (d)

(a) Two earth plates 1 ft. 6 in. square, 6 ft. apart and 6 ft. deep. (b) Two additional plates 4 ft. square, 6 ft. apart and 12 ft. deep connected together. (c) In addition to the plates under (a) and (b), four 8 ft. copper-weld rods were driven at 15 ft. apart and the whole connected together with 0.075 sq. in. copper strand 2 ft. deep. (d) In addition to plates under (a) and (b) an earth plate was sunk 40 yds. away near a brook and connected by 0.075 sq. in. copper strand 2 ft. deep.

While with the square plates used (Test 1) the resistances varied between 6 and 50 ohms, the results for B and E under assumed identical conditions (i.e., wet blue clay) showed a difference of 34 ohms. For F and G, when a bare conductor was laid 2 ft. deep (Test 2) the test results were much better. Driven rods were not used for G as rock was encountered.

Mr. C. Grover has given figures relating to two 1.25-in. iron-rod electrodes 48 ft. long. The first, buried 48 ft. in moist loam driven 30 ft. from a river showed a resistance of 5.5 ohms, and the second, buried 48 ft. in solid chalk, a resistance of 15 ohms with water encountered at 35 ft. These results indicate that in high resistivity soil an efficient earth cannot be obtained by increased depth. With a 20-ft. rod driven vertically the reduction in resistance by increasing the diameter from 0.25 in. to 2 in. was only 10 per cent.

The following test figures were obtained at a large outdoor sub-station (fig. 2) where some expense was incurred to obtain good results. The main neutral earth electrodes consisted of

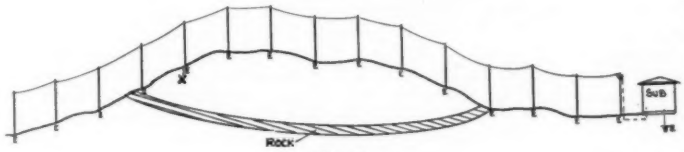


Fig. 4.

three 6-ft. cast-iron pipes, 6 in. in diameter buried 7 ft. 6 in. at 2 ft. centres with flanges kept above a complete coke surround. The pipes were bonded together and the whole coke surround well impregnated with salt. The auxiliary electrodes, shown at points E, consisted of single pipes of similar dimensions laid in identical conditions. The auxiliary and main electrodes were bonded together by 1.5 x 0.125 in. copper strip laid direct in the ground. Tested separately, the following results were obtained: Auxiliary electrodes, 3.5, 4.0, 3.5 and 4.5 ohms; main electrode, 1.0 ohm; the above, bonded together, 0.80 ohms.

Previous tests of experimental electrodes near the same site had shown that extreme care was necessary. In one instance two 14-ft. by 12 in. diameter pipes were buried 8 ft. apart in pits with coke surrounds well watered and with about 50 lb. of salt to each pipe. The pipes were bonded, but the bond was not buried and the test gave 18 ohms. The pipes were then connected as one electrode to the tanks of two outdoor transformers standing on a concrete plinth, with a test result of 1.5 ohm; with one tank alone the figure was 2.25 ohms.

The results with the transformer tanks were attributed at the time to the cables, which were laid direct in the ground to another sub-station. As they had only been laid a week or so and were not connected at their extreme ends at the time, a more likely cause, in my opinion, was the concrete plinth, which was still green and some 2 ft. 6 in. below ground level.

For obtaining data relating to the earthing of towers for overhead lines the electrodes shown in fig. 3 were used. Types 1 and 2 are essentially modifications of Type 3 made with a view to seeing if the results obtained with the latter could be improved. No. 3 is a standard 6-in. diameter cast-iron flanged pipe 6 ft. long buried 7 ft. 6 in. with a coke surround in an excavated hole. Type 2 is a similar pipe in an excavated hole 4 ft. 6 in. deep with 3 ft. of coke and salt surround, driven the last 3 ft. Type 1 is similar to Type 2 with an extra length of 9 ft. of gas pipe driven through the centre pipe, the two being bonded together. Tests with a number of tower positions, as shown in Table 2, proved conclusively that the additional costs of Types 1 and 2 as against Type 3 were not warranted. The results when the earth conductor was clipped in and bonded should be noted. None of the above tests was made under really dry conditions, which would probably have produced higher figures. One result is important, namely, the overall improvement by using a continuous earth wire.

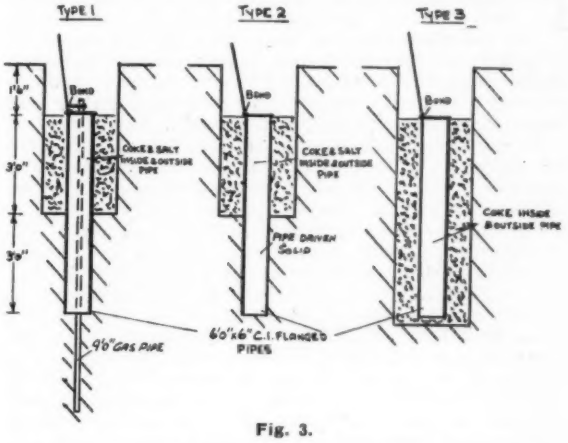


Fig. 3.

I was told of an instance of an overhead line on wood poles using "individual" pole earthing as against a continuous earth wire. A fault occurred at the point marked X (fig. 4) remote from the sub-station, and the earth-leakage trip failed to function. This is self-explanatory if reference is made to the figure. For small sub-station buildings or kiosk sub-stations, I would suggest that a sound and reasonably cheap earth could be obtained as indicated in fig. 5. Bonded-plate electrodes are first laid horizontally on levelled ground, a rubble course is laid between the plates and the concrete, and a number of pipes inserted through the foundation—the pipes connecting the rubble with a gutter formed in the concrete surround. This gutter would collect and feed the sub-soil during wet weather and also provide facilities for artificial treatment in dry weather. The main earth lead should, however, be available for inspection, and provided with a test link.

The Best Means

The conclusion I have formed is that shallow horizontal electrodes of strip or stranded conductor lend themselves to the best results (a great deal depending on the specific resistivity of the soil), and they are cheaper to install. They are reasonably accessible for inspection and treatment and are most likely to prove effective by lying in ground having the lowest resistivity and high average moisture content.

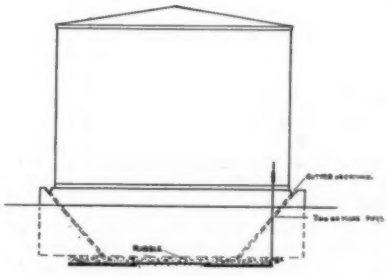


Fig. 5.

TABLE 2—*EARTH-RESISTANCE TESTS*

Tower No.	Type of Electrode	Resistance in Ohms. Electrode (a)	Tower (b)	(a) & (b) combined	SOIL. Type	Condition.	Remarks.
8	1	1.8	1.9	1.8	Blue clay	Wet	Line not strung.
13	2	3.7	8.5	3.3	Clay	—	do.
15	3	2.5	6.4	2.2	Hard clay	—	do.
17	1	4.7	4.8	4.7	Loam and ironstone	—	do.
19	2	1.2	1.3	1.0	Clay	Damp	Earth wire clipped in and bonded.
20	3	1.1	1.4	1.2	Earth and stone	Wet	do.
21	1	1.3	1.3	1.2	Rocky soil	Damp	do.
23	2	3.8	3.8	3.6	Hard clay, chalk after	Fairly dry	Line not strung.
25	3	1.6	1.5	1.6	do.	do.	do.
27	1	2.1	2.1	2.1	do.	do.	Earth wire in blocks.
29	2	2.0	2.0	1.9	do.	do.	do.
31	3	0.5	0.5	0.5	Sandy clay	do.	Earth wire clipped in.
33	1	1.7	1.7	1.7	Hard clay, chalk after	do.	Earth wire in blocks.
35	2	0.2	0.2	0.2	Loam and clay	Damp	Earth wire clipped in and bonded.
37	3	0.3	0.5	0.3	Clay	do.	do.
39	1	0.2	0.5	0.2	Loam and clay	do.	do.
41	2	0.3	0.5	0.3	Clay	do.	do.
43	3	0.3	0.7	0.3	do.	do.	do.
45	1	0.8	0.9	0.8	do.	Wet	do.

Great care should be taken to protect all bonded joints both from mechanical damage and from corrosion.

Operation Under the Grid. By S. A. Russell, A.M.I.E.E.

Getting the most out of the station

IT appears to be clearly indicated in the 1926 Act that the Central Electricity Board shall arrange a load programme for each selected station. The duty of operating the station in an efficient manner has rightly been declared to be the obligation of the owners of the station, the staff of which naturally have a wide general experience and the close local knowledge necessary to carry out this duty.

The wording of the relevant Section No. 7 (1) (a) of the Act is: "The owners of a selected station shall be under the obligation to operate the station so as to generate such quantity of electricity, at such rates of output, and at such times as the Board may direct, and to conduct such operations with due regard to economy and efficiency."

Generating station engineers have a peculiar pride in their own job. There has always been a good-natured rivalry between them in attempting to obtain a better coal figure, a higher overall thermal efficiency, than the engineer in another undertaking with similar possibilities; at the same time, they are always anxious and willing to discuss every problem, frankly and openly. It is sincerely to be hoped that nothing will occur in operation under the grid to undermine the pride, destroy the healthy rivalry, or prevent the free exchange of operating experiences.

The grid has introduced two major differences in operation. In the base-load stations the load factor has been, or will be, greatly increased, whilst others have to shut down entirely for long or short periods. The term "load factor," unqualified, does not convey much meaning, for a very high load factor, even up to 100 per cent., can be obtained if the maximum demand is low; what really should be aimed at, if the cost of production is to be the minimum, is to obtain the maximum possible kWh output from the more efficient stations and the highest load factor at this output.

In considering, first, the stations that are scheduled to give continuously a high rate of output, the efforts of the station engineers should be centred upon minimising the chances of breakdown. It should be agreed at the outset that satisfactorily to operate a station at its maximum kWh output it would be necessary to install more spare boiler plant than is normally required under independent operation, and it would seem reasonable to provide, in a station which may be required to operate at an annual load factor of 70 to 75 per cent., spare boiler plant to the extent, of say, 25 per cent.

Inspection of Stokers and Soot-blowers

The stoker plant should receive careful periodical running inspection, for it may be because such close attention is not given to the stoker gear as is given to the turbo-generator plant that boiler "outages" from stoker failures have been greater than they should have been. The operation of the soot-blowers, where installed, should be carried out regularly, and careful note made of their behaviour, so that when next the boiler "comes down" any necessary adjustments can be made to increase their cleaning efficiency. Together with soot-blowers it would be advisable to consider soot-removing plant and to take out the soot and fly ash whilst the boiler is steaming on the range.

The feed water must be suitably conditioned, for certain troubles have been intensified under present-day conditions of operation with higher steam temperatures. Thus, a feed water formerly classed as good may cause scale formation in a modern boiler, with subsequent bursting or blistering of the tubes. Trisodium phosphate is now used with marked success to prevent scale, but, unfortunately, its adoption seems to have coincided with increased carry-over in the steam, although this carry-over must also, to a great extent, be influenced by design of the boiler and the rate of ebullition of the steam from the water surface in the drum.

Arising from the carry-over, deposits in superheater tubes and on turbine blades are now more common. This may cause failure of superheater tubes, and also seriously restrict the output capacity of the turbo-generator. The deposits are, however, often readily soluble in water, and in the case of the turbine blades can be removed quite easily during off-load periods by washing the blading with wet steam or hot feed water injected with the steam whilst the turbine is turning at a very low speed.

Turbines kept continuously on load for long non-stop periods are the most affected, whereas peak-load units, due probably to the frequent running up and shutting down, may keep quite free from the trouble. No universal remedy seems possible; each case has, therefore, to be dealt with separately by the station engineers, and the optimum conditions of treatment and boiler water concentration determined.

Reverting to the boiler house, the fuel should be carefully selected and have characteristics which ensure free movement in the chutes, satisfactory behaviour during combustion, and freedom from serious clinkering; steadiness of quality is also a highly desirable feature. Air preheaters are often prone to choke and corrode. These troubles should be minimised by a careful study of the temperatures prevailing during various conditions of operation, and steps taken to prevent the deposition of acid moisture.

Lubricating Oil

Turbine oils are particularly sensitive to certain impurities which produce troublesome emulsion and sludge, and which may bring about deterioration in the oil itself. It is advisable for samples to be frequently tested in the station laboratory for any rise in acidity and loss of demulsification properties. During turbine overhauls the oil system and tanks should be carefully examined, and any sludge found analysed to determine the cause of its formation. Pockets in the oil passages should be carefully avoided in design, or if they do exist methods should be devised whereby the oil is prevented from lying stagnant in them. Improved ventilation of the bearings might be considered with advantage, and care should always be taken to prevent oil vapour around the generator rotor slip-rings.

Some machines seem to affect the oil more than others and, if possible, the reason should be ascertained. It may be that the bearing metal has been attacked by the oil, and careful examination of the bearings should be made at the next overhaul to see that no pitting of the metal has taken place. Continuous or periodical purification, either centrally or on each unit, helps to maintain the oil at a high standard.

Corrosion troubles can interfere with continuous operation. In economisers and boilers the dominating factor is dissolved oxygen, and it is essential that daily tests be made to ensure that by careful attention at all points it is kept at the lowest possible figure. Corrosion damage to turbine blading, valves, &c., generally commences during standing periods, and great care should be exercised at those times to ensure that no steam is leaking into the turbine cylinders.

Condenser Cleaning

Another serious handicap to maintaining the maximum kWh output from a station is frequent cleaning of condensers, and it is highly advisable to explore the possibilities of chlorination of the cooling water, particularly if there is any evidence of organic growths in the tubes. A quick and fairly efficient way of cleaning condenser tubes is to shoot leather or rubber plugs through the tubes by compressed air or water pressure. Condensers of 40,000 sq. ft. of cooling surface are regularly cleaned in this way in five or six hours. The secret of speed is to have bullets to the number of tubes in the condenser, one tube one bullet.

From my experience a well-equipped laboratory staffed by qualified chemists has proved to be essential in assisting the engineers responsible for a power station operating under the grid scheme to keep the plant in operation for the longest possible periods.

In considering, secondly, the operation of stations which are called upon to shut down entirely for certain times, the vigilance required from the operating staff is very little less exacting than that of their full-time brothers. Economical banking of boilers and bringing the boilers and ranges up to pressure each day, the running up of the turbo-generators, each with its own peculiar characteristics, the closing in again at night: all these operations require real operating skill and supervision, besides which the importance of careful inspection of all plant when idle cannot be too much stressed.

It is to be hoped that whoever has the responsibility of discharging staff men from a station which must be partly or wholly shut down for short or long periods will well consider every aspect of the possibilities affecting the plant.

To ensure proper control of the grid system, more especially at times of disturbance, it would seem very necessary that the grid control engineer should have a definite picture given to him by instruments of the position in the area at any time. A telephone service alone is not sufficiently definite in transmitting important operating messages between the grid-control centre and the power stations. Every precaution should be observed to prevent a wrong or misinterpreted instruction being acted upon.

The question of automatic synchronising requires very careful consideration; not so much synchronising under normal conditions, which is a comparatively easy operation, but the synchronising of two sections, one of which may be at a very low speed and voltage due to supply disturbance.

A.C. Integrating Meters. By Oliver Howarth, M.I.E.E., M.Amer.I.E.E.

Modern trends in design

CONSIDERABLE advance has been made in the design and manufacture of a.c. meters during the last decade. Metallurgical progress, coupled with intensive organisation of manufacture, has enabled the manufacturers to supply a more accurate instrument, in a smaller compass and at less cost, than was possible ten years ago.

The curve of most modern meters is fairly flat and the meters can be used continuously, and will register accurately, on loads up to double their rated current. At least one manufacturer is offering meters which will carry, and register accurately, four times their rated current. One result of this double-load feature is that supply undertakings have some meters marked, say 10 A, which cannot be used on loads exceeding that figure, and others marked 10 A which can be used on loads up to 20 A. It would be much more convenient for them if all meters were marked with the maximum current at which they would register accurately, and what is now called a double-load meter was sold as a long accuracy range meter, but no doubt the requirements of the British Standard Specification, and of the meter ring, would make this difficult.

Kay, Manchester

Mr. O. Howarth is technical engineer and meter superintendent to the Lancashire E.P. Co.

The increasing use of bakelite in the electrical industry has encouraged many manufacturers to offer meters in cases of this material, thus avoiding the need to earth each meter to comply with safety requirements. It is curious how the idea persists, even with modern a.c. meters, that the meter board must be insulated from the wall and from the fixing screws by means of insulating bushes, and that it is dangerous to earth the meter. The undertaking with which I am connected has been earthing its meters for the past fourteen years and it has been our experience that the practice has not introduced any difficulty.

The real advantage of the bakelite case is that it does not require enamelling or painting to recondition it, but it suffers from the very serious disadvantage that it is easy to break one of the fixing lugs when the usual two-screw cover is employed. No doubt this difficulty can be overcome, but so far the attempts have resulted in the production of a clumsy and bulky cover.

Manufacturers are prolific in their output of new prepayment devices, with the result that there are types available which are unlikely to attract much custom. The proportion of domestic consumers who take advantage of the two-part tariff is considerable and is increasing. Under these circumstances the two-part tariff prepayment meter with variable fixed charge is likely to be the popular one in the future, with the flat-rate meter as the alternative for purely lighting consumers. The next development will probably be in the direction of improving the three-coin mechanism so that the operation is identical with the single-coin meter, the mechanism automatically giving the correct amount for the coin inserted.

Polyphase Patterns

Considerable improvements have taken place in the design of polyphase meters, which can now be purchased with so little interaction between the elements that the accuracy is not impaired by extreme unbalance of loads or by a reversal of the phase sequence. It is not always realised that a meter the accuracy of which is dependent upon correct phase sequence is likely to be inaccurate if the load is considerably unbalanced. Manufacturers have not yet offered polyphase meters with the double-load feature.

Whilst an induction meter can be used to measure a quarter of its full rated load within the same percentage limits of error as full load, a measuring device employing a linear scale will be liable to the same error all along the scale; thus at one-quarter of the scale length it will be liable to four times the percentage error which it may have at full load. Hence the mechanism errors of a maximum-demand indicator have to be kept down to the minimum if a reasonable degree of accuracy is to be achieved on the lower half of the scale.

Some of the earlier demand indicators were very crude measuring instruments; the mechanism errors were so considerable that no attempt was made to reduce some of the other errors to which the instruments were liable, with the result that errors of 5 per cent. were common when the meter was operating at half load.

The external clock with its escapement or pendulum, the contact maker and the plunger or armature, and the tripping mechanism for the demand indicator train are all potential sources of failure, and the elimination of many of these by fitting one of the modern self-starting synchronous motors as an integral part of the demand indicator mechanism is a decided advantage.

Allowance is not always made by manufacturers in the scale or gearing for that portion of the period during which the demand indicator train is out of gear, and thus an avoidable error of half per cent. or so is introduced. The escapement of a pendulum clock can be slowed down to compensate for this, but not the synchronous clock. The latter has the advantage that the periods can be synchronised on any number of demand indicators without interconnecting them and making them all dependent upon one clock, but it is essential that the gearing and scale should be arranged to take into account the actual period during which the demand indicator mechanism is in gear and not the nominal period.

Many of the manufacturers of single-phase meters do not make polyphase meters with demand indicators, and in consequence the choice is more limited. If it is desired to purchase a three-element polyphase meter with demand indicator the choice is very limited indeed. The two-element three-phase four-wire meter is commonly used and is accurate, provided the sum of the voltages of the three separate phases is equal to zero.

This is a condition which is enforced within small limits at any point at which a three to four-wire transformation takes place, such as when the supply is taken from the secondary of a delta-star transformer. This condition does not necessarily exist on a network, and errors may be introduced by the indiscriminate use of these two-element four-wire meters. It is, however, simple and inexpensive to install three single-phase 5-A meters, operating from the same current transformers, to act as checks on the registration of the three-phase meter.

Few kVA Meters

The small demand for kVA meters is naturally insufficient to encourage manufacturers to develop new types, and the only recent addition is a Continental copy of an American type which uses a sphere to obtain the vector sum of kW and kVAR.

The introduction of mumetal in commercial current transformers has enabled considerable improvement to be made in the accuracy of meters which operate in conjunction with them. No such comparable progress has been made with voltage transformers and the increasing tendency to compress them into smaller compass has resulted in the use of low-rated three-phase transformers whose errors alter appreciably if a small change is made in the secondary burden. It is well to bear in mind that the rated burden of a voltage transformer is the range of burden over which certain errors are permissible.

Obviously, a given change of burden will produce four times the error change on a 50-VA as on a 200-VA transformer. Three-phase voltage transformers change their errors with change of phase sequence, and, when used with a metering equipment, are inferior to two single-phase voltage transformers.

The requirements of grid metering have made available a greater range of apparatus and an improved standard of accuracy, but unless the user demands that these improvements should be incorporated in the meters which he purchases for measuring power loads, the more usual metering equipments will not improve. Progress depends upon the attitude of the purchaser, as well as upon the skill of the manufacturer.

Special metering equipments are liable to be "change for a shilling" so far as the manufacturer is concerned. He much prefers the more sure bread-and-butter business of supplying thousands of single-phase meters. It is only reasonable, therefore, to give a greater share of the single-phase meter orders than would otherwise be given to the manufacturers who are most obliging in supplying the more special requirements of the purchaser.

Lamp Rating Economics. By D. J. Bolton

Are the present ones the best that can be devised?

THE lamp manufacturers presented us with a handsome New Year's gift in the shape of more efficient lamps. We were promised a better 60-W lamp to match the new 40-W one which appeared last year, and have actually been given 60-, 75- and 100-W types, so that there are now four sizes of coiled-coil lamp on the market. To look a gift horse in the mouth is proverbially unwise, but at the risk of appearing ungracious I question very strongly whether the present ratings are the best that could be devised; whether, in fact, some slightly different lamp, costing no more and having on the average no higher efficiency would not prove a better proposition.

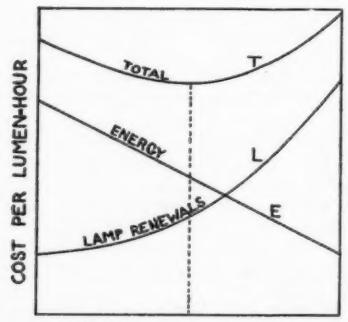
To settle this point it is necessary to go back to first principles to see exactly what we are doing in lighting a given space in some particular way. We are, in fact, burning a number of lamps and an amount of energy to produce a result in lumen-hours. Roughly, the aim is to get the maximum number of lumen-hours for our money, provided that the distribution of the light and size of the individual lamp units are satisfactory. The achievement of this aim evidently depends upon the correct proportion between lamps and energy. A little more spent on the lamps may mean a considerable saving in energy, and *vice versa*; *i.e.*, the most suitable proportions vary from place to place. The question then is: What is the most economical rating for a lamp in the particular position concerned?

With most electrical apparatus the rating has to be determined largely by physical considerations. We cannot get ten horse-power out of a five horse-power motor for long without serious, if not disastrous, consequences and the same sort of thing is true of a cable, a transformer or a switch. A 30-c.p. lamp, however, will give 60 c.p. for a considerable period; and, furthermore, there are circumstances under which it will pay to run it so, more light being obtained for a given total expenditure than would be the case with the lamp on its normal rating.

Factors to be Considered

Lamp ratings are limited not by the danger of an immediate burn-out, but purely by economic considerations. The 30 c.p. is not the intensity which it will give without sudden danger to itself, but merely the intensity which has been found to give the best result for the money *in some particular circumstances*. This point is the crux of the whole matter, for the circumstances depend on the size and price of the lamp and the price of the energy, three vital and independent variables.

Let us consider a particular lamp, say, of 40 W, intended by the makers for use on 100 V, and suppose that it be run at various voltages from 95 to 105. At 5 per cent. below rated voltage it will have a lower efficiency, giving less lumens per watt, so that more kilowatt-hours will be required to obtain the same number of lumen-hours. At the same time its life will be increased so that fewer lamps will be required in a given time. The one change will increase the cost and the other will decrease it. If the increase is smaller than the decrease the total cost will be less than before, and in such a case it will pay to under-run the lamp in this way. In some other case, say when energy is very expensive, it might pay to over-run the lamp by running it on 105 V or more so as to get a higher efficiency with a shorter life.



The relation of voltage to life and cost

It may be argued that in each case the lumens per lamp will be altered as well as the efficiency, and this will upset the economic apple-cart. But if the flux per lamp proves too small or too great for the particular illumination scheme it is always possible to substitute 60- or 25-W lamps, the price of these being the same as for 40-W lamps. Alternatively, it may be supposed for the sake of argument that the filament dimensions can be changed so as to give the same lumens per lamp at the new rating.

As in many other problems a graphical method gives the best illustration, if not the best solution. The base of the graph should represent rating and can be scaled in applied voltage from 95 to 105 per cent. with 100 (normal rating) as a centre line. Since the efficiency is approximately proportional to the square of the voltage, the base can also be scaled in efficiency, say, from 9 to 11 lumens per watt if the normal rating is 10. As a third scale on the same base line the corresponding life can be shown, and this will run from approximately 2,000 to 500 hours when the normal is 1,000. The ordinates can be scaled in £ s. d. for a given total number of lumen-hours.

[*Elliott & Fry*

Mr. D. J. Bolton, M.Sc., M.I.E.E.

There are then three curves on the graph, namely, the cost of the lamps L; the cost of energy E; and the total cost T (the sum of the two). As the rating goes up from 5 per cent. below to 5 per cent. above normal the cost of lamp renewals will approximately double, while the cost of energy will drop owing to the higher efficiency. These rising and falling curves will combine to form a total curve as illustrated, and the minimum point on this will show the position of economic rating. This minimum will, of course, occur when the slopes of the two component curves L and E are equal and opposite. In the case shown this occurs exactly at the normal rating point. *N.B.*—The figure must be regarded not as representing any case in particular, but as an illustration of the general principle. Moreover, constant amounts have been subtracted from the heights of the curves in order to keep them on the graph without altering their slopes.

Effect of Changes

Now let us consider the effect of changes in the three variables previously mentioned. If the price of energy goes up the curve E will be raised and steepened. This will have the effect of rolling the curve T in a clockwise direction, *i.e.*, the minimum point will be shifted to the right so that it will pay to over-run the lamp. If the lamp price were increased the curve L would be raised and this would twist the total curve in the opposite direction so that under-running would be indicated. The result of using a larger lamp of equal cost would be the same as increasing the energy price, since the curve of energy cost would be raised in proportion to the curve of lamp cost.

In order to obtain precise results it is well to leave the graph and to resort to an algebraic expression. It was seen that there are two possible sets of conditions, namely, (a) when the same lamps are used throughout, and (b) when the same lumens per lamp are maintained. The former is open to the ordinary lamp user, who can buy existing lamps of a slightly different voltage from his own, and so over- or under-run them. This will, however, have the effect of altering the size of his illumination unit, so that he must be able to use more or less points at will in order to bring his total lumens to the same figure as before. The latter condition, namely, constant lumens per lamp, is possible only to the manufacturer since no one else can get inside the lamp to snip bits off the filament, &c. I have shown elsewhere* that with normal tungsten lamps the most efficient result occurs when the expenditure on energy is 5 times the expenditure on lamp renewals in case (a) and 6⅔ times in case (b).

Of the three variables mentioned the price of energy varies most since it may range from ¼d. to 6d. per kWh almost in the same street. Selection on account of energy price is therefore most important, and consumers on cheap energy circuits should under-run their lamps by purchasing somewhat larger and higher voltage lamps than would normally be required. Consumers using expensive energy should do just the reverse. Unfortunately, action of this kind is difficult because there is no general course that can be recommended. It is a gospel for the individual not for the group, since I may be on an "all-in" tariff paying ¾d. or ½d. per kWh while my neighbour pays 4d. for his lighting energy. More-

* *Journal I.E.E.*, 1926, Vol 64, No. 356.

over, the individual is probably non-technical, and unless well instructed he had better leave things alone.

An Opportunity

The other variables—lamp size and cost—are much easier to deal with. Lamps are like a fleet of vessels, each of a different size, but each capable of being perfectly adapted to its own particular service. Why cannot the lamp makers, now that they are launching a new fleet, take the opportunity of loading them, not all equally, but each to its own most appropriate level? This would mean having a different rating (and therefore life) for each size of lamp. The results would not suit everybody, because of the different energy prices, but they would suit far more people than the present dead level. Of course, if the lamp prices were proportional to their size in watts these two items would cancel out, but the prices are not so proportioned, and in the small sizes there is even an inverse connection. If the lamp and energy prices are both constant, and if 1,000 hours is the correct life for a 40-W lamp, then the 15-W size should have rather more than double this life, and the 100-W size rather less than half.

Since individual energy prices cannot be catered for, the best thing is to take the mean price. The present average price for lighting and domestic supplies in this country is approximately 2¼d. per kWh. This covers places where the heating and lighting are at widely different rates, so that the latter averages at a higher figure. But it also covers "all-in" tariffs where the secondary rate is much lower than this, and since the fixed charge is not affected by the choice of lamps it is the secondary rate that determines the economic position. On the whole, therefore, it may be presumed that 2¼d. is about the effective average. Now maximum economy occurs when the energy expenditure is 6⅔ times the lamp expenditure. It follows that at this energy price the lamp size in watts divided by its price in shillings should equal 32. If the figure is higher than this the lamp should be over-run and if lower it should be under-run.

At a price of 1s. 3d. the 40-W lamp is exactly correct on its present rating and at a price of 1s. 9d. the 60-W lamp is very nearly so. Smaller lamps, since they cost less in energy, should also cost less in lamp renewals in order to be economic, *i.e.*, they should have a longer life at the expense of a somewhat lower efficiency. Larger lamps cost more to run and should, therefore, cost more to keep in replacement.

Astonishing Figures

The following table gives a set of retail prices for tungsten lamps both 100 and 200 V from 15 to 200 W. Opposite each is given the life and the efficiency (per cent. of present value) which it would have if run so as to give maximum economy with energy at 2¼d. per kWh.

Size in W.	15	25	40	60	75	100	150	200
Price	2/–	1/9	1/9	1/9	2/6	2/6	5/–	7/6
Economic life (hours) ...	3,530	2,010	1,340	940	1,060	824	1,060	1,170
Economic efficiency (per cent. of present value)	82.8	90.0	95.7	101	99.2	103	99.2	97.7

The results are a little astonishing. The "baby of the family," the 15 W, should have a life of more than three times its present one when energy costs 2¼d. per kWh or more. The 25- and 40-W sizes are also overrun economically at their present ratings. The 60- and 100-W lamps, on the other hand, are at present under-rated and should be worked more intensely whenever energy is at 2¼d. or less. A flat rating of 1,000 hours for each size was no doubt originally chosen for the sake of simplicity, but there is no justification for it whatever now that the position is better understood.

Lamp users are not electrical engineers, and we who are have a duty to perform in the matter. They cannot act for themselves and they rely on their technicians to give them the best service which is obtainable for the money. This we are notably failing to do, since the ratings we have chosen are not the best that could be devised. Surely the time has come to take cognisance of the fact that the lamp which is best when energy costs 6d. is quite unsuitable for energy at ¼d., and the life which is appropriate to a 15-W lamp is quite wrong for a 100-W. The manufacturers have been satisfied to give us a set of "new lamps for old"; must we wait for some Aladdin to come along in order to tell us how to use them properly?

Water-heater Regulations. By S. F. Osborne

IT is not unreasonable to suggest that electricity supply undertakings, hiring out and installing electric water heaters, should pay the same regard to the by-laws and regulations of the water supply authorities in their areas as they expect their contractors to pay to the regulations of the I.E.E. and the Electricity Commissioners, or any other rules which they recommend, or have the power to enforce. Those responsible for such installations, however, have often a very limited knowledge of the water authorities' requirements, and in some cases are unaware that any regulations exist.

[*Jerome*

Mr. S. F. Osborne

Though most water authorities allow direct connection of water heaters up to a capacity of three gallons (in addition to heaters with a visible broken feed), this does not mean that any heater up to this capacity can be so connected. Many of the leading manufacturers of electric water heaters have had their heaters passed by the Metropolitan Water Board for direct connection, and these are accepted also by a large number of other water undertakings throughout the country.

There are, however, a number of heaters which have not yet been accepted and would not be passed without certain modifications. Heavily loaded geysers are usually required to have a rubber-hose water connection and to be earthed to a proper earth-plate, not to a water pipe or fitting. When a storage heater is connected to the water main no other connection may be made between the pipes, either on the inlet or outlet side of the heater, and any other tank or pipe.

This point has recently been overlooked where outlets of three-gallon water heaters installed in hairdressers' premises have been connected to mixing taps. In such cases the regulations can be met by installing non-return valves of approved make on the inlet side. This will necessitate the addition of an expansion pipe to discharge over the main cistern.

In order to overcome the difficulty of running expansion pipes to the main storage cistern in large blocks of flats, cistern-type heaters are often used. Where these are connected to the feed from the cold storage cistern they are not much affected by regulations, though there are certain requirements which must be met.

When a supply from a storage cistern is not available the connection is made from the water main to the ball-valve cistern incorporated in the electric heater. Under these conditions the storage cistern of the heater should meet the requirements of the authorities with regard to construction, though not necessarily in capacity. There are requirements with regard to the position and method of fixing the ball valves; size and position of inlet feed with respect to the outlet; and the position of the overflow. There is at least one make of ball-valve heater which does not meet the requirements of the Metropolitan Water Board in any of the foregoing particulars.

The details of the construction of ball-valve cisterns recommended by the British Waterworks Association in its specifications for standard water pipes and fittings could well be followed by some of the manufacturers of electric water heaters. The sticking of the ball valve gives constant trouble in some water heaters. A ball valve sticking in the lifted position often restricts the flow of water into the tank, causing the heater to run dry.

Notification of Installation

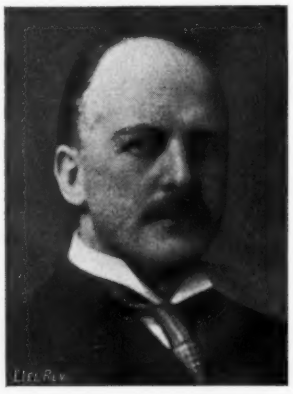
No heater should be fixed with direct connection to the water main without previous notification being given to the water supply authority. Such a notification should state the address at which the heater is to be fixed; the make, type and capacity of the heater; and the proposed date of installation. This is a regulation of a large number of the water authorities in this country, but is complied with by very few who carry out the installations.

In the same way as electricity supply authorities expect a consumer to notify them of alterations or additions to wiring installations, so should notification of alteration to pipes be given to the water supply authorities, even though connection may not be made to the water main.

Regulations and specifications are made for the benefit of the consumers as well as for the authorities, and compliance with them leads to greater satisfaction on both sides.

The New President of the I.M.E.A.

MR. EDWIN SEDDON, M.I.E.E., M.I.Mech.E., who succeeds Mr. E. E. Hoadley as president of the Incorporated Municipal Electrical Association, has been engineer and manager of the Edinburgh Corporation Electricity Department since 1924. He was born in 1880 and received his engineering training at the Ashton-under-Lyne Technical Institute, following this up with a six years' apprenticeship with Messrs. Turner, Atherton & Co. at the Whitehouse Iron Works, Denton, Manchester.



[*Jas. Bacon & Sons*

Mr. E. Seddon, the new president of the I.M.E.A.

His first connection with electricity supply was in 1901 when he joined the staff of the Blackpool Corporation undertaking under the late Mr. R. C. Quin and afterwards under Mr. Charles Furness. Mr. Seddon gained a varied municipal experience during the next eleven years at Hanley (Staffs), Eastbourne and West Ham. In 1912 he became chief assistant engineer at Edinburgh, which post he held until he was appointed to succeed Mr. Frank Newington as chief.

During the period of his control the energy sent out has increased from 70 million to 180 million kWh (exclusive of exports to the grid) and the local maximum demand has risen from 28,000 to 60,000 kW in 1933-34.

Although the City of Edinburgh has mainly academic associations, over 40 per cent. of the energy consumed in the area in 1933-34 was supplied for power purposes, under a tariff for the larger l.v. consumers of £3 15s. per kVA and 0.24d. per kWh. The tramways took 17 per cent. of the total. Domestic heating absorbed rather more than 14 per cent., a combined tariff being offered for all uses of ½d. per kWh for a consumption up to ten times the number of kWh allocated for lighting and ¼d. per kWh for all further heating. Over a thousand cookers were out on hire at rates of from 20s. to 30s. per annum, including maintenance. Nearly 22 per cent. of the electricity sold was used for lighting. Bulk supplies are given to the Lothians Electric Power Co. in its western area and to the Leith Dock Commission.

Mr. Seddon was responsible for the recent extensions to the Portobello power station, which has now an installed capacity of 117,000 kW and generated last year nearly 300 million kWh, a large proportion of which was taken by the Central Electricity Board. The latest official returns give a thermal efficiency (on kWh generated) of 22.24 per cent., the coal cost being 0.091d. per kWh sent out.

Mr. Seddon's address as chairman of the Scottish Centre of the Institution of Electrical Engineers in 1930-31 made a notable addition to the information available on electricity in poultry farming. Another important contribution of his towards the general stock of technical knowledge, based on first-hand experience, was his paper on the design, equipment and operation of static sub-stations which, in conjunction with Mr. J. Eccles, he presented at the I.M.E.A. Convention in 1933. Mr. Seddon is chairman of the Central Board's Consultative Committee for Central Scotland.

A 400-kV X-ray Installation

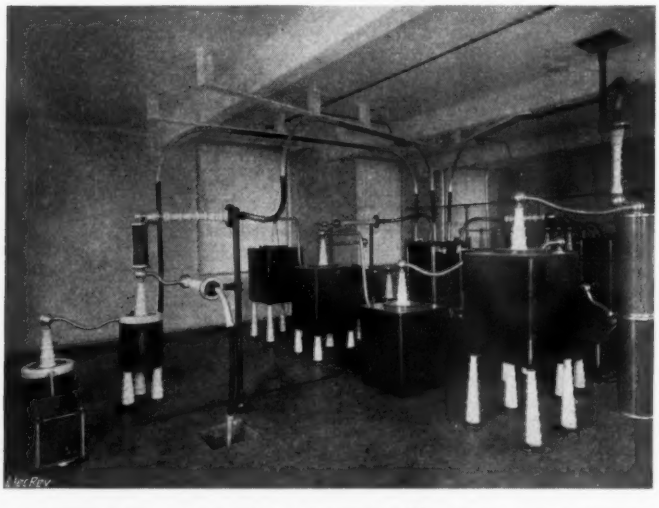
THE British Post-Graduate School and Hammersmith Hospital which was opened by H.M. the King on May 13th contains a radiological department, said to be larger and more modern than any other in the United Kingdom. The diagnostic and therapeutic sections are kept entirely separate. The latter consists of four rooms in which the patients are treated.

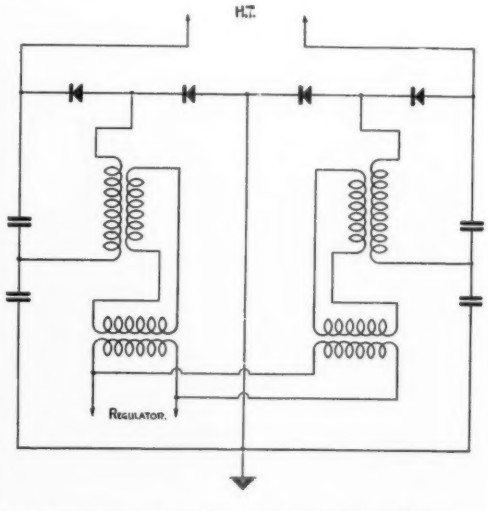
Current for the X-ray tubes is generated in two separate high-voltage units installed on the floor above the patients' rooms. Each unit feeds two shock-proof X-ray tubes in parallel, one pair being at 200 kV and the other pair at 400 kV, all in separate rooms. These units operate on the voltage-doubler (Greinacher) principle. The high-voltage transformer feeds current through two rectifiers into two condensers in series which discharge through the X-ray tube, two 200 kV units being coupled up in series to give 400-kV.

Two outstanding points are the use of Westinghouse oil-immersed metal rectifiers designed to withstand 230-kV (peak) instead of the hot-cathode valves that have hitherto been employed in such units and the use of Callender cable for transmission to all the tubes, which for the 400-kV units gives 200 kV to earth. The total load current rating of the 200-kV plant is 20 mA and of the 400-kV plant 10 mA.

A Ferranti remotely controlled continuous voltage regulator feeds two 1 : 1 transformers, which in turn feed two high-voltage transformers mounted on porcelain columns. Their tanks are at 100 kV to earth and their high-voltage terminals at 200 kV to earth. These terminals are connected through the metal rectifiers to four high-voltage condensers.

The 400-kV equipment is shown in the foreground of the accompanying illustration; at the back and behind the steel mesh is the 200 kV plant. The square box on the left is a capacity-inductance stabiliser for the filament current of the X-ray tube, while the two circular tanks are cascaded transformers to feed filament current to one of the 400-kV X-ray tubes to which the cables pass through the square holes in the floor. The four square tanks in the centre of the picture house the metal rectifiers.





A general view of the deep therapy machine room, and a diagram of the Westinghouse 400 kV metal rectifier equipment

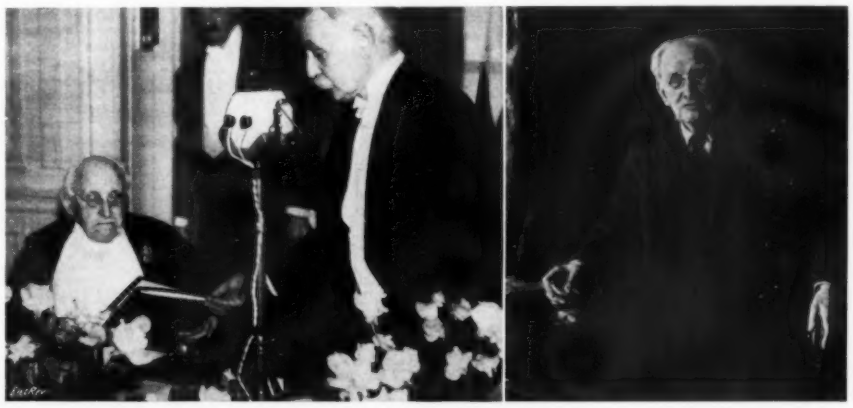
An oil-immersed switch for each unit contacts the high-voltage current to either of the two tubes on each unit, or to both in parallel. It consists of a solenoid-operated, remotely-controlled lever which pushes three oil-immersed contacts home into spring contacts. One of the three is the anode pole, while the other two are cathodes and carry not only high-voltage but also the 12-V filament current.

The switchgear and high-voltage transformers were made by Messrs. Schall & Son, Ltd., who carried out the whole contract for the London County Council.

Colonel Crompton's Ninetieth Birthday

A REPRESENTATIVE gathering of several hundred leading personalities in the electrical and engineering industries paid tribute to Col. R. E. B. Crompton at a banquet in celebration of his 90th birthday at the Savoy Hotel on May 31st. The presidents of the Royal Society, Institutions of Civil, Mechanical, Electrical and Automobile Engineers, and the International Electro-Technical Commission were the hosts. Sir Arthur Stanley, who occupied the chair and proposed the loyal toast, read a selection of the 159 congratulatory messages which had been received from many parts of the world, including one from the Duke of Connaught, who served in the same corps as Col. Crompton and was his junior subaltern.

Sir James Swinburne, who was at one time employed by Col. Crompton as a dynamo designer, proposed the health of "A Pioneer," referring to Col. Crompton's work and the many honours he had earned, including his recent election as a Fellow of the Royal Society. Sir James then presented the Colonel with an illuminated address signed by 336 subscribers to a portrait in oils painted by Mr. G. Harcourt, R.A., which at present hangs in the Royal Academy and which Col. Crompton has, in turn, presented to the I.E.E.



The presentation to Col. Crompton, and (right) a reproduction from the photograph of the painting

Col. Crompton, who was accorded musical honours, in returning thanks remarked that he had been a Jack-of-all-trades, but, with intervals, had worked in the electrical field for fifty-seven years. Few had had such an interesting life as his and he was proud of the army of friends he had made. He was grateful for the friendship, loyalty, and devotion of his co-workers.

Prof. W. M. Thornton, as president of the I.E.E., acknowledged Col. Crompton's gift of his portrait to the Institution.

Mr. R. E. L. Maunsdell, vice-president of the Institution of Mechanical Engineers (deputising for the president who was attending the "Mechanicals'" summer meeting at Bath) presented Col. Crompton with the certificate of his election as an honorary life member of the Institution.

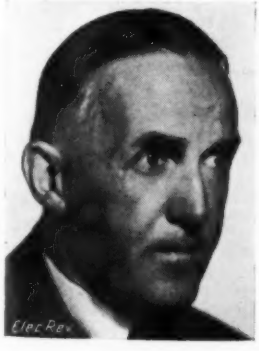
Mr. George Balfour, M.P., (deputising at short notice for Sir Richard Redmayne, president of the Institution of Civil Engineers, who was prevented from attending by a bereavement), proposed "The Electrical Future." He said he would not attempt to prophesy, but wished to add his humble tribute to the admiration that had been expressed of Col. Crompton and all that he had done for the industry. They watched with interest how recently formed bodies were developing themselves while they had been developing the industry. During the short time which those bodies had had in which to assume their responsibilities they had, he thought, "done very well." He expressed his confidence in the electrical future. In the past one had heard too much about this country "lagging behind," a statement which he had always denied.

Sir John Snell, chairman of the Electricity Commissioners, in responding to the toast, said that the estimates of electrical development in this country were being more than exceeded. The growth of the domestic uses of electricity had been remarkable.

Prof. Sir J. Ambrose Fleming, in proposing "Our Chairman and Hosts," remarked that it was an unprecedented event for the presidents of six such important societies to be associated to honour one who was a member of all those bodies, for his long and useful life-work. Sir Arthur Stanley responded and the company adjourned for a reunion.

I.E.E. Council Nominations

MR. J. M. KENNEDY, O.B.E., Electricity Commissioner, has been nominated by the Council of the Institution of Electrical Engineers for the presidency of the Institution for the session 1935-36. Mr. Kennedy was born in 1879 and is the son of Sir Alexander B. W. Kennedy. He was educated at University College School and at Cambridge, and received his early electrical training with Messrs. Richard Moreland & Son, Willans & Robinson, and Siemens & Halske, Berlin. Until his appointment to the Electricity Commission last year he was a partner in the firm of Kennedy & Donkin, consulting engineers, with whom he was responsible for electrical undertakings in many parts of the world. He assisted the Electricity Commissioners in the preparation of the national schemes under the Electricity (Supply) Act, 1926, and acted as adviser to the Central Electricity Board and to the Northern Ireland Government in connection with their schemes of electrical distribution. He also prepared estimates of the cost of railway main line electrification for the Weir Committee of 1931. Mr. Kennedy is president of the Association of Supervising Electrical Engineers and a member of the Institution of Civil Engineers. **Mr. A. P. M. Fleming,** C.B.E., M.Sc., has been nominated as vice-president of the Institution. He is a director and manager of the Research and Education Departments of the Metropolitan-Vickers Electrical Co., Ltd. **Mr. F. W. Crawter,** late London manager of the Chloride Electrical Storage Co., Ltd., has been nominated to fill the vacancy of hon. treasurer, while those nominated for election as ordinary members of the Council are **Mr. E. S. Byng,** vice-chairman and joint managing director of Standard Telephones & Cables, Ltd.; **Prof. C. L. Fortescue,** O.B.E., M.A., Professor of Electrical Engineering at the City and Guilds College; **Mr. P. Good,** deputy director of the British Standards Institution; and **Mr. F. E. J. Ockenden** (associate member), director and chief research engineer, Messrs. Everett, Edgcumbe & Co., Ltd.



Davey & Taylor

Mr. J. M. Kennedy

Lord Hirst chatting with Mr. F. Parkinson at last Friday's dinner to Col. Crompton

A Neon Turret Clock. By T. R. Robinson

A new South London landmark

THE illumination of turret clocks during the night hours has always been rather a problem. Many schemes have been tried at various times including dial-plates of ground glass, floodlighting the dials from outside, the more common method of internal illumination from behind opal glass, and even mounting rows of small lamps on the hands themselves. None of these methods is particularly effective, and with the modern development of neon tubes the outlining of the hands and chapters in this way presents an opportunity to make the clock really conspicuous at night, while the transparent tubes do not noticeably affect the day-time appearance of the dials.

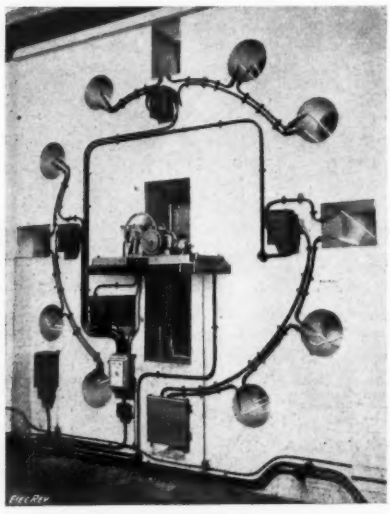
Several clocks of this neon-tube type have been made for advertising purposes, but the first permanent timekeeper of the kind to be erected in London is the four dialled clock on the turret of Messrs. W. H. Smith & Sons' new stationery factory and bookbinding works in Lambeth.

It will be appreciated that to mount the necessary tubing and to feed the required h.v. supply on to the moving hands of a clock presented a far more difficult problem than in the case of an ordinary sign, but by careful attention to detail the designers overcame the difficulties.

The usual method of driving all four dials from one central mechanism was considered impracticable, and a separate movement of the synchronous motor type was constructed for each dial. Perfect synchronism between the dials is maintained by the controlled-frequency supply. The totally-enclosed synchronous motors drive through worm and spur gears, each mechanism being mounted directly behind the dial centres so that the hand movement is obtained without any bevel-work or shafting. This makes the neon work simple and straightforward.

How the Tubing is Fitted

Relatively large openings are pierced through the tower walls at the points of the chapters, and the feeders carrying the h.v. supply to the glass tubing outside have a considerable air-gap all around them. The same method has been adopted as far as possible with the hands, but here it was necessary to provide stout bearings at the dial centres to carry the weight of the hand assemblies. The diameter of the dials is 11ft. 6in., but the mounting of the neon tubes makes the hands considerably heavier than those normally used with dials of this size, and specially designed bearings were accordingly provided. To assist in the work of maintenance a removable panel is fitted in the opening at the centre of each dial, thus giving access for oiling and adjustment.



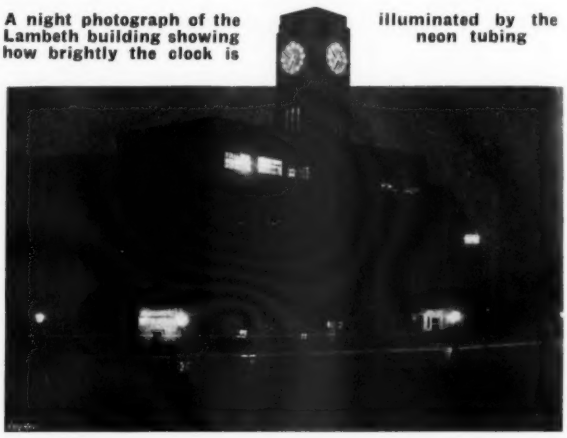
Behind one of the dials

The cables and transformers for the tubing are mounted on the inner faces of the tower walls directly behind the dials they serve and, as with the mechanism, each dial is provided with its own complete and independent equipment. The hands are served by their own transformers and the current is led to the tubes by special slip-rings. It is in the design of these that the success of the clock rests, for the greatest care was necessary to ensure that the supply was uninterrupted, that arcing was overcome and that the cables were as widely spaced as possible despite the small space available at the dial centres. The cable conduits are neatly spaced and arranged.

Porcelain insulators are used wherever possible. The contact work and brush assemblies are so constructed as to permit of easy cleaning, and the replacement of the parts subject to wear. The tubing is securely held to the hands by clips, giving safety in the roughest weather and yet making it possible for the tubes to be changed quickly in the event of failure. Connections also received special attention, for it was realised that they must be capable of withstanding constant movement and inclement weather conditions owing to the very exposed position.

Each dial unit is mounted on a flat-bed casting and is compactly arranged with its motor, reduction gear, motion work and slip-rings well spaced, but with no room wasted. Over each unit is placed an easily detachable metal cover, and a heater for cold weather guards against thickening of the lubricating oil. Owing to the high voltage which is used some form of protection is necessary, and a tripping mechanism was fitted which cuts off the supply from the neon lighting transformer circuits when the trap-door giving access to the clock room is opened. The door is of wire mesh, and as it is slid back an arm attached to it actuates an iron-clad switch inserted in the feeder circuit.

A night photograph of the Lambeth building showing how brightly the clock is illuminated by the neon tubing



Considerable Space Saved

Apart from its interest as a neon-illuminated timepiece the clock has the additional point of note in that its unit construction enables the central space in the clock room to be used for storage. With the older mechanical clocks this space behind the dials was occupied by the clock movement or by elaborate bevel wheels and shafts. Where it was essential to use the space, the drive to the dials often called for many specially made sets of bevel wheels and odd lengths of shafting with universal joints. Electrical operation of clock dials has cleared these away and provided additional useful space.

From the point of view of visibility the clock is a complete success and the time can be read at a great distance. The brilliantly glowing lines of the hands and chapters show up exceptionally well even in misty conditions. The success which has attended this installation suggests that this form of dial illumination will be widely used in the future, especially in view of the steadily advancing technique of neon tube manufacture. The clock mechanism, together with its special attachments, was constructed by Messrs. Gillett & Johnston, Ltd., of Croydon.

Electricity's Progress

ON June 3rd the House of Commons considered, in Committee of Supply, the Vote for the Ministry of Transport. Mr. Hore-Belisha, the Minister, said that during the fifteen years since its creation the Ministry had been engaged in unremitting activity in legislation and in administration. It had been responsible for no fewer than twelve important Acts dealing with railways, electricity supply, highways and bridges, the regulation of road vehicles and road traffic and the co-ordination of traffic. The grid, constructed under the Act of 1926, now covered the whole country and was in full operation in seven out of nine areas, with the result that the generation of electricity, previously in the hands of 600 independent undertakers, had in Great Britain become a national system, co-related under a central control. The enterprise had made widespread demands on the resources and ingenuity of British manufacture. Since 1929 the public supply of electricity had expanded by about 50 per cent., whereas the similar expansion for the world at large had been only about 10 per cent. At Bournemouth this week was meeting the first National Convention of all branches of the industry, and he had no doubt that attention would be turned towards means of improving distribution and unifying the basis of charges. In the meantime they must recognise the progress which had been made in the increased number of kWh generated from 10¼ millions in 1929 to 15½ millions in 1934, and the additional number of consumers, which was increasing at the rate of 600,000 a year.

The Late Mr. D. N. Dunlop

THE electrical industry has been deprived of the services of one of its most distinguished representatives by the death of Mr. Daniel Nicol Dunlop, O.B.E., Director of the British Electrical and Allied Manufacturers' Association. Mr. Dunlop was engaged with the affairs of the organisation until a few days before his death, which occurred on Thursday, May 30th. In recent years he had had periods of illness, but had recovered and in the week before last he journeyed with others to the British Industries Fair at Birmingham in normal health. Upon his return to town he was indisposed and on Monday last week an operation for appendicitis was performed in a private ward at the Royal Northern Hospital, Holloway, pneumonia supervening with fatal results.

Mr. Dunlop was born, of Quaker stock, in Ayrshire, in 1868, and was thus sixty-seven years of age. He married Miss Eleanor Fitzpatrick, who died several years ago, and he leaves a son, Mr. R. O. Dunlop, a distinguished artist, and two daughters, all of whom were present at the funeral service, which took place at Golder's Green Crematorium on Monday afternoon last.

He entered the engineering world as an apprentice with the Howe Machine Company of Ardrossan. He was attracted to the United States and at the age of twenty-six, at the works of the American Westinghouse Electric Co., and at its New York offices, he had experience of the production of electrical machinery and of methods of accounting. After three or four years he returned to this country (in 1899) as an employé of the Pittsburgh firm, and the Westinghouse works at Trafford Park were erected. He acted as assistant publicity manager here both for the English and the other European branches of the company.

The late Mr. D. N. Dunlop, O.B.E., Director of B.E.A.M.A.

At about this time we first made his acquaintance in a small office in Norfolk Street, Strand, London, where he and Mr. Warren, who had had wide electrical publicity experience in the States, were beginning activities. We little dreamt then how large a place Mr. Dunlop was destined to fill in connection with the organisation of the great British electrical and allied industries. He represented the Westinghouse Electric Manufacturing Co. here and in Manchester for a number of years in various capacities, including publicity manager and subsequently also sales manager.

During these years many efforts were made to adopt group plans for preventing disastrous undercutting. They were not successful. Later a number of leading electrical manufacturers definitely got together in London and we were allowed to attend their meetings. For some years they continued to deal with various trade and other problems of common interest. The movement spread northwards and, as the electrical and allied engineering industries were becoming increasingly important, the need for a larger and stronger organisation conducted on more ambitious lines to deal with internal foreign competition and other matters, was recognised. In 1911, therefore, the National Electrical Manufacturers' Association gave way to, or was absorbed in, the newly formed B.E.A.M.A., with Mr. D. N. Dunlop as its Organising Secretary, a post which was renamed Director in 1917.

From 1911 until 1935 he had continuously held that office, though several years ago he was joined as co-director by Mr. V. Watlington, a former chairman.

The N.E.M.A. performed a useful service, but its operations were limited by its membership. Mr. Dunlop is credited with the original conception of the B.E.A.M.A. organisation as it has subsequently developed, carrying its influence in innumerable directions affecting electrical science and industry. He was prominently identified with the Electrical Research Association and the Electrical Development Association, and all movements connected with electrical progress, education, research, standardisation, &c. He found himself as time went on a member or chairman of a host of committees. He believed in committees heart and soul, and his tactfulness and conciliatory influence in this connection are common knowledge among B.E.A.M.A. members and their representatives.

He was founder of the World Power Conference which brought representatives of about forty nations together for the interchange of ideas. In this work the B.E.A.M.A. Council gave him an entirely free hand.

He was chairman of the Fair Trading Council whose policy has been under discussion during the last year or two. It was one of various attempts in which he was interested for reconciling very many conflicting views within the home industry. It is said that by conciliatory round-table conferences he often brought everyone into final agreement.

The study of any annual report of the Council of B.E.A.M.A. suffices to convey a general idea of the close relations into which he was brought with institutions, associations, conferences, and committees in his continuous operations carried on in the interests of the electrical industry.

Mr. Dunlop was sometimes described as a Scotch metaphysician; and his private philosophic studies are held to have engendered in him a detachment of mind enabling him to face delays and opposition with patience and equanimity.

The Funeral

A very large congregation attended the religious service which was held at Golder's Green Crematorium on Monday afternoon. The building was filled to overflowing by representatives of Mr. Dunlop's public and private interests. Brief addresses were delivered by Dr. Zeylmans, from Holland (representing many Continental friends and admirers), annd Mr. M. Wheeler, both of whom spoke of Mr. Dunlop's deep interest in and zeal on behalf of the Anthroposophical Society.

Dr. Zeylmans said that throughout his life Mr. Dunlop had been a searcher after spiritual knowledge, and in the studies of Rudolf Steiner he had found what he was seeking. Mr. Wheeler followed, referring to the intellectual help that Mr. Dunlop was always eager to render to members of the Society; he mentioned briefly his pre-eminence in the business world, the B.E.A.M.A., and the World Power Conference; and prophesied that he would be remembered as a far-seeing pioneer who had worked for the advancement of mankind.

The following were among those present: The Swedish Consul-General; Mr. S. C. Faraker, representing the Australian Government; Mr. J. A. Hirst (chairman of B.E.A.M.A. Council); Mr. M. J. Railing (vice-president and past chairman). Members of B.E.A.M.A. Council: Messrs. A. Berkeley, E. C. Holroyd, Dr. A. H. Railing, Allen West, H. A. Aston, H. T. Rice (representing Mr. G. H. Nelson), Herbert Taylor (representing Mr. J. Taylor), and E. J. Summerhill (representing Mr. P. F. Turner), Mr. C. Procter Banham (representing Mr. J. L. Wilson), Mr. V. Watlington (Director), Mr. C. Rodgers (Secretary), Mr. C. A. Weekes (Secretary to the Council), and the staff of the B.E.A.M.A. Representatives of the World Power Conference, Sir John Snell and Mr. Grieves (Electricity Commission), Mr. J. Hacking (Central Electricity Board), Mr. H. Marryat (E.C.A.), Mr. W. G. Stiles (C.M.A.), Mr E. B. Wedmore (E.R.A.), Mr. G. S. Francis (E.D.A.), Mr. D. A. Bremner (British Engineers' Association), Mr. P. Good (B.S.I.), Mr. F. C. Vine (A.M.A.), Mr. C. W. Sully (E.L.M.A.), Mr. W. P. Bean (E.L.F.A.), Mr. W. Finlay (Scottish E.C.A. and Fair Trading Council), Mr. R. N. Gregor (Meter Makers' Association), Mr. Felix Rogers (Fair Trading Council), Mr. A. H. Bridge (ELECTRICAL REVIEW), and Mr. C. H. Gray (World Power Conference).

An Appreciation. By Mr. M. J. Railing

As one who has been a member of the Council of the B.E.A.M.A. since the formation of the Association twenty-four years ago, and having just completed my term as Chairman of the Council, I have had unusual opportunities of close and almost daily contact with the late Mr. D. N. Dunlop. In his work as Director of the B.E.A.M.A., touching a wide variety of problems affecting the interests of many branches of the electrical industry, in discussion and in action, he displayed outstanding qualities which mark him in my memory as a gifted personality.

He sought the path of conciliation. Fertile in suggestion and resource in all matters under discussion, he was never more resourceful than when pointing to the way by which men of strong conviction might tread a common path together to attain a common purpose.

The mainspring of his activity was co-operation in industry, and its first notable fruition was, of course, the B.E.A.M.A., which owes its birth and growth to his vision, tact and energy. With its success his name will be remembered. The Electrical Development Association, the Electrical Research Association, the Fair Trading Council—all owe much to Mr. Dunlop's vision, and will, I believe, prove enduring testimony to his gift for finding the way leading to development and progress. His mind reached out to the wider field of international co-operation among scientists and engineers, and his foundation of the World Power Conference is an example of his love of peaceful collaboration.

These are achievements of substance and permanence, and required precisely those qualities of enterprise, tact and ability which were so characteristic of him.

M

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Works Visits

From time to time you have made suggestions likely to be helpful to young engineers in their careers. In my opinion, the young draughtsman or engineer can make no better investment than going out into the factory to see "how the wheels turn." It is even better if he goes to another factory and gets a glimpse of different methods of manufacture and production. This should, of course, be done in an open manner; a feeling of friendly inquiry should be abroad during the visit.

A keen mind will soon see the comparative values of the methods employed by rival firms and will appreciate them. An idea used in a coal mine may be found applicable to the factory wherein the visitor works.

The Institutions of Mechanical and Electrical Engineers arrange visits for their junior and senior members during the winter months to various places of interest, as do also the Draughtsmen's Association, and foremen's societies. These visits, however, are usually made to a works when the plant is idle, and thus much of the value of the visit is lost, as it is easier to understand how an operation is done when the plant is running.

It is a good thing for engineers to inspect plants whilst they are working. They are then able more easily to compare methods, and it does one good to come up against the other man's problems.

Some firms employ men whose job it is to conduct visitors round the factory during working hours. Such firms are shrewd enough to realise that a visitor to their plant is of more value to them than if he had visited a rival plant. A specific instance of this is an engineer from a boiler works who visits a machine tool works. When next the visitor is in the market for machine tools he will favour those tools which he has seen in the course of manufacture in preference to those he does not know. Other things being equal, he will order the tools from the makers whose works he has visited and whose manufacturing processes he has inspected.

Those who cannot obtain leave for visits can rely upon articles in the technical Press by representatives who visit new plants and report on them. This is all to the good, as valuable information can thus be gleaned. Much more, however, can be done by a friendly personal visit, and it is a good idea to take a note book and compare notes with rival engineers; but it is essential to be diplomatic.

Birmingham, *May 30th.* D. MACLAREN CATHCART.

Unauthorised Discounts

The letter from Mr. W. G. Nottage on the above subject in your issue of May 31st is interesting but belated. He says that a parasite is finding its way into the electrical industry. Good gracious me! This parasite found its way into the industry many years ago, and it has grown from a small parasite into a huge monstrous reality that threatens the very existence of many electrical retailers and contractors. I do not think there is any trade so badly hit as the electrical trade through the asking for, offering and giving of unauthorised discounts.

The refrigerator trade is comparatively new, but the other sections of the trade have suffered long years—wireless, lamps, fittings, irons, radiators and everything that goes to make up a retailer's and contractor's business. If at the National Convention an agreement can be arrived at by all the parties interested and a Fair Trading Policy for the industry adopted and put into practice, then this Jubilee Year will see the commencement of a period of sensible trading in electrical goods and prosperity for those genuinely engaged in it.

Of all the hundreds of thousands of men engaged in the electrical industry I do not think there is one per cent. or one-tenth of one per cent. who, when they go shopping, either to the butcher, baker, tailor, bootmaker or any other tradesman, would dare to ask for a discount off their purchases. Why, then, should any electrical re-seller give any of his margin away when another tradesman comes to his shop? The whole thing is wrong and a stand must be made against it.

List prices *must* be selling prices to everybody who buys (except for re-sale) and once this is understood by the public they will not refuse to buy, as electrical goods are wanted (and most prices are low enough now, some too low) and the public will still have them. The giving of unauthorised discounts is treachery to the trade, and must be ruthlessly stamped out by every means at our command.

Sincere, sensible and business-like co-operation between all sections of the electrical industry is long overdue. May the National Convention prove to be the dawn of a new era, and may we soon realise the ideal of this industry, composed of many parts, so built up into one complete machine that it will carry out its functions in the best possible manner, without friction, and obtain results that will not only prove of immense advantage to the trade itself but will enable it to do its duty to the public. HARRY MOSS.

Bradford, *June 3rd.*

Trolley-bus Accidents

On May 29th the Minister of Transport stated in the House of Commons that trolley buses were involved in 6.09 personal injury accidents per 100,000 car-miles run, as against 9.3 in the case of tramcars. He said this showed that trams were involved in 50 per cent. more personal injury accidents, and without qualifying his remarks in any way allowed it to appear that the figures were a fair comparison, although only referring to London.

It has always been claimed for tramways that they are the safest transport in every way, and the Minister's statement is, no doubt unwittingly, quite misleading and unfair to tramways, which already have been attacked too much on no proper basis. The facts are, as anyone knowing London well enough will at once realise, that the approximately 20 miles of trolley-bus route in London are almost entirely in quiet streets which for considerable periods are entirely devoid of ordinary traffic, while Kingston, the busiest part, is nothing like so congested as it used to be. On the other hand, the 300 miles odd of tram route are mostly in the busiest and most congested streets of London.

In other words, the figure of 6.09 personal injury accidents for trolley buses is actually very high compared with 9.3 for trams. S. G. JACKMAN.

Harrow, *June 1st.*

Snapped by our photographer at Bournemouth.—Left: Mr. and Mrs. E. E. Sharp and Sir William Ray. Right: Mr. H. C. Price, Mr. C. J. Fox, Mr. and Mrs. A. G. Bruty, and Mr. H. Marryat

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Fair Trading

The June issue of the *I.M.E.A. Journal* says:—"The Council have now given further consideration to the draft of the Fair Trading Policy prepared by the Fair Trading Council and they have intimated that this Association agrees in principle with the Policy. There are, of course, certain details to settle and a further Joint Committee is being arranged."

British Industries Fair

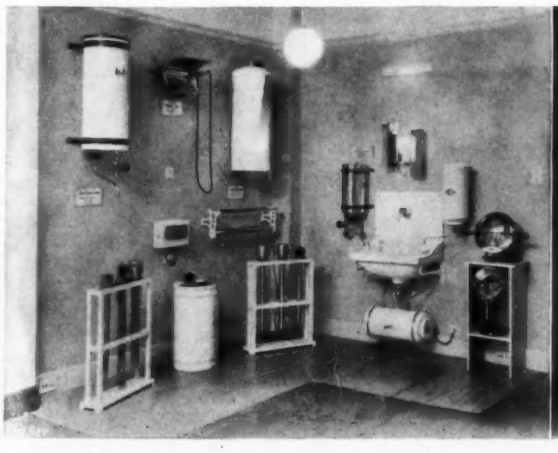
Although the date of the 1936 Engineering and Hardware Section of the British Industries Fair, Birmingham, had not been fixed when this year's Fair closed on May 31st, exhibitors have already booked space for next year and in a number of instances have applied for a larger area than they had this year. The amount of business done in the lighter branches of the electrical industry has been better than in any previous year, particularly in articles for domestic use. This experience emphasises the work which the industry is doing in developing the domestic applications of electricity. The overseas buyers who have been most interested in this group have, in the main, come from the Scandinavian countries. In the heavy branches of the industry where, owing to the nature of the business, actual orders at the Fair are not expected, requests for drawings and estimates have been numerous. Excellent openings have been made with certain Empire countries for additional plant and some of the largest exhibits in the engineering group bore labels showing that they were being sent to South Africa and other parts of the Empire. The total attendance, including buyers from home, overseas and other visitors, was 115,828, compared with 124,178 in 1934.

Imported Japanese Lamps

As a result of discussions with the Japanese Government and after consultation with the United Kingdom lamp manufacturers, it has been decided not to increase the duties on electric lamps, provided the imports from Japan during the year beginning April 1st, 1935, do not exceed the following totals: Lamps of 20 V and over, 4,300,000; lamps under 20 V: Motor vehicle lamps, 5,600,000; flashlight lamps, 22,800,000: other lamps, 1,100,000.

New Municipal Showrooms

New showrooms for the Burgh of Rothesay Electricity Department have recently been opened. The exterior of the building, which is situated in one of the main shopping thoroughfares of the town, is finished in light fawn terazzo stone designed on modern lines, and arranged for floodlighting. The showrooms include a lounge with examples of modern lighting and heating, a special section showing different methods of water heating, types of bathroom lighting and heating, and ultra-violet ray equipment. There is also a section with demonstration cabinets for displaying pendant lighting fittings, table lamps and electric fires. The facilities for demonstrating appliances include a lecture-demonstration platform. Behind the main showrooms the building is laid out as a store and workshop for the service and maintenance work connected with the Sales Department. The accompanying illustrations show the water-heating section and the lighting demonstration cabinets.



The new showrooms of the Burgh of Rothesay Electricity Department, showing water heaters and lighting demonstration cabinets

The Canadian Radio Market

Electrical News and Engineering states that radio receivers sold in Canada during 1934 numbered 167,177, valued at $7,344,635 as against 130,493 ($5,383,846) in 1933 and 133,454 ($6,758,959) in 1932. Of the total sales in 1934 standard broadcast receivers accounted for 81,651 sets ($2,772,259), selective wave receivers for 70,380,430 and all-wave sets for 15,042 ($1,191,946). Ontario took 40 per cent. of the 1934 sales; Quebec, 18.8 per cent.; Saskatchewan and Alberta, 13.9 per cent.; British Columbia, 10.1 per cent.; Manitoba, 9.7 per cent., and the Maritime Provinces, 7.5 per cent.

Works Visits

On May 27th a number of Post Office engineers who were attending the Post Office Telegraph and Telephone Convention at Swanwick, visited the works of the D.P. Battery Co., Ltd., at Bakewell. Our picture shows Mr. J. Waddell, chairman and managing director of the company with Mr. F. G. C. Baldwin, M.I.E.E., superintendent engineer at Newcastle-upon-Tyne.

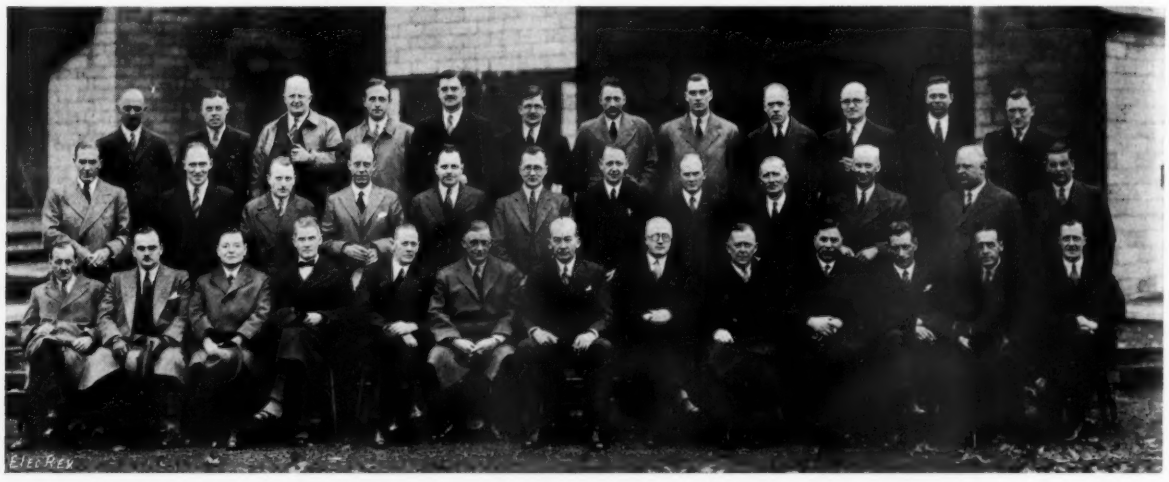
Mr. J. Waddell (left) conversing with Mr. F. G. C. Baldwin (centre) during a visit of P.O. engineers to the D.P. Battery Co.'s works

Members of the Institution of Mechanical Engineers who were attending the annual meeting of the Institution at Bath and their lady friends visited the works of Petters, Ltd., Yeovil, on May 30th. They were received by the chairman, Sir Ernest W. Petter, the directors of the company, and members of the staff. After a brief introduction they were conducted through the foundry, power house and machine and erecting shops of the oil engine works. The visitors were afterwards entertained at luncheon by Petters, Ltd., the Yeovil and District Association of Glove Manufacturers and Aplin & Barrett at the Manor Hotel, Yeovil, about 160 persons being present. Mr. C. Day, of Mirrlees, Bickerton & Day, on behalf of the visitors thanked Sir Ernest Petter for arranging an interesting morning, and Sir Ernest expressed delight at the visit of fellow members of the Institution to the works. In referring to the business of Petters, Ltd., he stated that in the past the company had always been proud of the high percentage of its export trade; in 1931 it was 70 per cent. of the whole. During the past few years a bad time had been experienced, but now export trade had begun to brighten, and although it was far from being restored there was every indication that things

were looking up. The visitors later went to Westland, where they were conducted round the aircraft works.

A Switchgear Sales Conference

A conference of representatives from all parts of the British Thomson-Houston Co.'s organisation was recently held for the purpose of discussing the latest developments in the company's switchgear design and testing. The conference was presided over by Mr. G. E. Riley (manager, Switchgear Sales), who was supported by Messrs. J. L. Wilson and J. S. Ramsden (directors), Messrs. F. H. Clough (assistant chief engineer), A. Easthope (manager, Willesden Works), E. P. Grimsdick (chairman and managing director, A.E.I., India, Ltd.), and about sixty members of the staff from all the district offices as well as Rugby and Willesden works. The first part of the conference was devoted mainly to lectures and discussions at Willesden, and the second part included some demonstrations at the new switchgear testing plant in Manchester. Papers were read by Messrs. J. M. Goodall, H. E. Cox, and L. Drucquer.



Members of the B.T.H. staff who attended the recent switchgear sales conference

Scottish Electrical Contractors

The Electrical Contractors' Association of Scotland held its annual general meeting and conference at Taymouth Castle, Aberfeldy, from May 24th to 27th. The annual general meeting was held on the Friday afternoon at which the board's report for the past year was submitted, showing the membership of the Association to be 299. At Saturday afternoon's session Mr. H. G. Mackerron, the new president, took as the subject of his presidential address "Registration," in which he expressed the view that so long as the electrical trade was exempt from compulsory registration so long would individual examples of scamped work exist. The second subject for discussion was introduced by Mr. Henry Meighan, of Glasgow, who explained the present position as regards the official general conditions of contract. On Friday a dance was held in the Banner Hall and on Saturday morning the annual golf match East *v.* West for the Pratt Trophy was played and resulted in a tie. A putting competition for ladies and gentlemen attracted many competitors, and together with a sweep on the golf match raised a considerable fund for the Association's Benevolent Fund. At night the whole party took part in a whist drive in the large drawing-room of the Castle.

Irish Free State Electrical Imports

There was again a very active state of affairs in the electrical trade in the Irish Free State during March last, the imports of electrical machinery and material during the month having attained a value of £79,777 as compared with only £47,955 in March, 1934. The appended table shows the imports during the first three months of the current and past years :—

	January–March. 1934.	1935.
	£	£
Electric motors	7,849	10,815
Other electrical machinery	37,119	60,203
Dry batteries and parts	5,057	4,933
Electric lamp bulbs	10,321	15,118
Electric lighting accessories, fittings, and parts	10,493	17,476
Electric insulated wires and cables	13,612	23,043
Telegraph and telephone apparatus	3,068	1,165
Radio receivers, complete	13,725	18,111
Radio-gramophones, complete	941	12,390
Other radio apparatus, fully or partly assembled	2,048	1,928
Radio parts and accessories	18,338	19,077
Other electrical goods and apparatus	40,192	51,380
	£162,763	£224,488

Noise Abatement

Last Friday the Prime Minister opened the Noise Abatement Exhibition at the Science Museum, South Kensington, the organisation of which has been directed by a special committee under the chairmanship of Sir Henry Richards, and including representatives of the Ministry of Health, Office of Works, Admiralty, National Physical Laboratory, General Post Office, British Broadcasting Corporation and the Industrial Health Research Board, as well as a number of industrial research laboratories and firms.

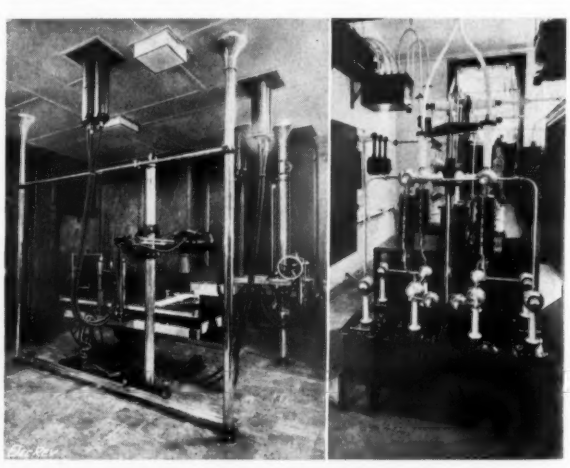
The Western Electric Co., Ltd., is demonstrating apparatus and showing films.

London Transport Scheme

On Wednesday the Chancellor of the Exchequer announced that arrangements have just been concluded between the Government and the Standing Joint Committee of the London Passenger Transport Board and the main line railways, under which, subject to the necessary Parliamentary sanctions, the Transport Board, the London and North Eastern Railway and the Great Western Railway will enter at once upon a programme of great improvements and extensions of London transport. The programme, he said, involved the building of about 12 miles of tube railways, the electrification of approximately 44 miles of suburban railway, the doubling and electrification of about 12½ miles of further suburban railways, and the substitution of trolley-buses for tramcars on 148 route miles.

Middlesex Hospital X-ray Department

With a total area of approximately 11,500 sq. ft., the Diagnostic X-Ray Department, including the radiological museum, photographic room, lecture room, and staff and students' accommodation, at the new wing of the Middlesex Hospital is one of the largest in the country. The administrative and executive offices are centrally placed, and comprise the hon. radiologist's room, reporting and viewing room, reception and records office. Immediately adjacent to the reporting room are the dark room and film-drying room. Two gastro-intestinal and chest rooms, two general radiographic rooms, one "small bone" room and one surgical room are provided. The problem of transport of films was a difficult one, but has been solved by the employment of a conveyor system.



Motor-driven tilting table and unit for automatic stereo radiography at the Middlesex Hospital. Right: Single-phase h.t. 4-valve transformer unit, with auto-transformer behind.

Entirely automatic equipment enables films to be dried as a routine in twenty minutes. The screening rooms are equipped with specially designed stands and motor-driven tilting tables, and apparatus is also installed for automatic stereoscopic chest radiography. The main radiographic rooms are

fitted with Potter Bucky tables, enabling work to be carried out at distances up to 6 ft., and with apparatus for radiography in the erect. The department is "shockproof" throughout, the majority of the equipment having been manufactured in the London works of Messrs. Newton & Wright, Ltd.

Key Industry Duty

A representation has been made to the Board of Trade under Section 10 (5) of the Finance Act, 1926, for the exemption from duty of grid-controlled rectifiers of the cold cathode neon type. Any communication should be addressed to the principal assistant secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, within one month from May 31st.

Jubilee Floodlighting

Referring to photographs of Jubilee floodlighting in our issue of May 24th, Messrs. Falk, Stadelmann & Co., Ltd., ask us to state that they were responsible for the installation at the St. Pancras electricity showrooms (page 749) and for the special motor-driven colour-changing projectors employed in the sunk gardens at Brighton illustrated on page 759.

Equipment for the "Queen Mary"

Messrs. W. Crockatt & Sons, Ltd., have received an order for a complete outfit of their patent electric salinometers for the *Queen Mary*. This order follows on the completion of the *Normandie* outfit and apparatus for other liners. In addition, the company has in progress a large number of instruments for naval vessels.

The Ezilite Conversion Set

The manufacturing rights of the "Ezilite" bed-switch conversion set, described in our issue of August 3rd, 1934, have been acquired by T.M.C.-Harwell (Sales), Ltd., 233, Shaftesbury Avenue, W.C.2, who have effected several improvements in construction. In addition, maroon, gold or white flex can be obtained and either brown or white bakelite switches.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances.

	CHEMICALS, ETC.	Price, June 5th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic ... ... per cwt.	50s.	—
a	Ammoniac, Sal ... ... per ton	£40	—
a	Ammonia, Muriate (large crystal) ... ,,	£38	—
a	Borax ... ... ,,	£17	—
a	Copper, Sulphate ... ... ,,	£19 15s.	—
a	Potash, Chlorate ... ... per lb.	3¾d. to 4¼d	—
a	,, Perchlorate ... ... ,,	6d	—
a	Shellac ... ... per cwt.	£4 18s.	—
a	Sulphur Commercial... ... ... per ton	£11	—
a	,, Roll ... ... ,,	£11	—
a	Soda Chlorate ... ... per lb.	3¼d. to 3½d.	—
a	,, Crystals ... ... per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
	METALS, ETC.		
b	Aluminium, Ingots ... ... per ton	£100 to £105	—
b	,, Wire ... ... per lb.	1/1 to 1/9	—
b	,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£209	—
	Grade II ... ... ,,	£143	—
	Grade III ... ... ,,	£73	—
c	Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
c	,, Tubes (solid drawn) ... ... ,,	9½d. to 9¾d.	—
c	,, Wire, basis ... ... ,,	7¼d.	—
c	Copper Tubes (solid drawn) ... ,,	10d.	—
g	,, Bars (best selected)... ... per ton	£64	—
g	,, Sheet... ... ... ,,		
g	,, Rod ... ... ,,		
d	,, (Electrolytic) Bars ... ... ,,	£37 10s.	10s. dec.
d	,, ,, Wire Rods ... ,,	£41 10s.	10s. dec.
d	,, ,, H.C. Wire ... per lb.	6¾d.	¼d. dec.
f	Ebonite Rod ... ... ,,	1/6 to 2/– plus	—
f	,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n	German Silver Wire... ... ... ,,	2/5	—
h	Gutta-percha, fine ... ... ,,	nom.	—
h	India-rubber, Para-fine ... ... ,,	4¾d.	—
i	Iron, Pig. (Cleveland No. 3) ... per ton	62/6	—
i	,, Wire galv. No. 1, P.O. Qual... ,,	£20	—
g	Lead, English Pig ... ... ,,	£15 15s.	£1 dec.
g	Mercury ... ... per bot.	£11/7/6 to £11/17/6	—
e	Mica (in original cases) small ... per lb.	6d. to 1/–	—
e	,, ,, medium ... ,,	5/– to 10/–	—
e	,, ,, large ... ,,	10/6 to 17/6 up	—
p	Phosphor Bronze, plain castings ... ,,	1/1	—
p	,, ,, drawn bars & rods ,,	11¼d.	—
p	,, ,, rolled strip & sheet ,,	10¾d.	—
p	,, ,, wire ... ... ,,	12¼d.	¼d. inc.
o	Platinum ... ... per oz.	£7	—
d	Silicum Bronze Wire ... ... per lb.	7¾d.	¼d. dec.
r	Steel, magnet, in bars ... ... ,,	7¾d.	—
g	Tin, Block (English)... ... ... per ton	£226 5s.	£2 15s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

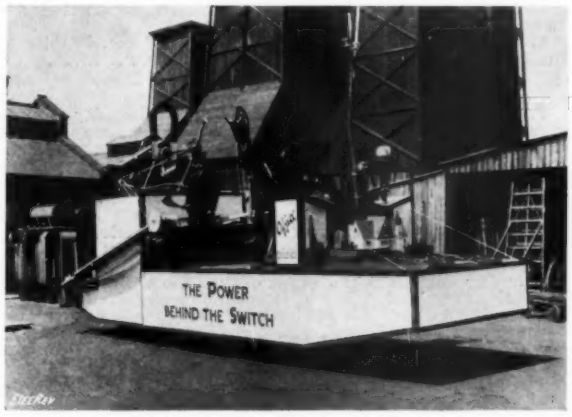
Social Events

The staff of the Rawlplug Co., Ltd., visited Margate on May 30th for their annual outing, travelling on the s.s. *Royal Eagle* from Tower Pier, lunching *en route*. The party dispersed for the afternoon, assembling at the Queen's Highcliffe Hotel, Cliftonville, for tea. The occasion was taken to present a cheque to Mr. W. R. Rawlings, who is celebrating his golden wedding. Mr. Rawlings expressed the wish that the money should be used for the endowment of a cot in a hospital.

The annual golf match between the staffs of the Metropolitan-Vickers Electrical Co., Ltd., and Ferranti, Ltd., was played on May 27th at Prestbury. The "Met.-Vick." team, which was represented by Messrs. G. E. Bailey, J. S. Peck, K. Baumann, J. C. Whitmeyer, J. G. Lowe, T. Fraser, T. T. Evans, R. B. D. Lauder, H. C. Pierson, and A. W. Clarke, was defeated by the narrow margin of one match by the Ferranti team which comprised Messrs. V. Z. de Ferranti, D. Z. de Ferranti, J. Binnie, J. W. Davies, O. M. Robson, M. Carr, W. Tyldesley, C. W. Bridgen, M. K. Taylor, and W. G. Bass. The "Met.-Vick." team thus for the second year in succession had the privilege of entertaining their opponents to supper after the match.

A Winning Carnival Tableau

The accompanying illustration shows the tableau of the Kettering U.D.C. Electricity Department at the recent local



The Kettering Electricity Department's tableau at the recent local hospital parade

annual hospital parade. The design, which is of a power station and distribution system on a "Heath Robinson" basis, was awarded the first prize in the trade section.

Trade Announcements

Cryselco, Ltd., has removed its Glasgow branch to larger premises at 165a, West George Street, Glasgow.

Messrs. Downes & Davies have opened a new branch at 94, Chester Street, Birkenhead (telephone: Birkenhead 4341).

Meta, Ltd., has opened an office at 396a, Produce Exchange, Fennel Street, Manchester. The Chorlton showrooms will remain open for retail business.

The General Electric Co. (India), Ltd., announces that its new address in Delhi is 8-E, Inner Circle, Connaught Place, New Delhi. (Telegrams: Kilowatt, New Delhi. Telephone: 2515).

New Catalogues and Lists

Osborn & Sharp, 18, Gibson Street, Glasgow, W.2.—A pamphlet describing the "Sharborn" relay.

Hague & McKenzie, Ltd., Sloane Street, Birmingham, 1.—Particulars of a new "Pyramid" iron.

Eea-Ray Sales, Ltd., 3, Sandland Street, High Holborn, W.C.1.—A catalogue of silvered glass reflectors.

Westinghouse Brake & Signal Co., Ltd., 82, York Road, King's Cross, N.1.—A booklet on chargers for electric vehicles.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A 36-page booklet dealing with turbine vacuum cleaning.

Mathews & Yates, Ltd., Cyclone Works, Swinton, Manchester.—Some particulars of the "Cyclone" refuse collecting plant for woodworking machinery.

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue section dealing with fire detection, indication, protection and automatic alarm apparatus.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—A leaflet on the "Wonder" wash-boiler.

Cooper & Smith, 14, Chicheley Street, York Road, S.E.1.—A leaflet drawing attention to the "Hexley" modern electric light fittings.

Electrical & Auto Products (1931), Ltd., 280, Deansgate, Manchester, 3.—A leaflet on the Runbaken "Handyman" compressor.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.—Details of electric fans and "Sparton" refrigerators.

Walsall Conduits, Ltd., Excelsior Works, West Bromwich.—Electric fires are the subject of a new illustrated brochure.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.—A leaflet advertising "Elasta" electric lamps.

Philco Radio & Television Cpn., Ltd., Perivale, Middlesex.—Particulars of the 1936 "Empire" receiver.

Constable, Hart & Co., Ltd., Broadway Buildings, Westminster, S.W.1.—A leaflet on the "Parlee" automatic door-opener.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, E.C.2.—Details of the "Bedal" refrigerator and a new vacuum cleaner have been received.

Rowlands Electrical Accessories, Ltd., R.E.A.L. Works, Hockley Hill, Birmingham, 18.—A booklet has been issued printed in colour, mainly for builders, on inset and panel fires.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—A publication relating to street lighting equipment.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, Oxford Street, W.1.—A folder on the Hotpoint-B.T.H. washing machine.

Ransome & Marles Bearing Co., Ltd., Newark-on-Trent, have issued a comprehensive catalogue which, in addition to listing types and sizes of bearings, deals with the question of mounting and maintenance in such a manner that it can be used as a reference work.

Enfield Equipment Co., Ltd., Trinity Street, Enfield.—A new brochure dealing with condensers.

Callender's Cable & Construction Co., Ltd., Victoria Embankment, E.C.4.—A folder giving particulars of "Ankalite" cables for street lighting.

Wardle Engineering Co., Ltd., Old Trafford, Manchester, 16.—Catalogue No. L.23, describing a range of new lighting units for use with electric discharge lamps.

Switchgear & Equipment, Ltd., Delavox Works, Banbury.—A leaflet on an oil-immersed self-reclosing circuit-breaker.

G.W.B. Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.17, have sent a copy of "Shell-Wild-Barfield" technical brochure No. 2, on quenching oils.

F. J. Gordon & Co., Ltd., 114, Euston Road, N.W.1.—Particulars of battery chargers.

L. G. Hawkins & Co., Ltd., 30, Drury Lane, W.C.2.—A humorous booklet produced for the National Convention.

Bankruptcy Proceedings

F. G. Harrison, Ramper Charging Station, Saundby, Notts, wireless and electrical contractor.—The first meeting of creditors was held recently at the Official Receiver's office, 1, St. Swithin's Square, Lincoln. Debtor had prepared a statement of affairs which showed gross liabilities of £1,170, of which £1,091 was expected to rank for dividend. The net assets were £218, leaving a deficiency of £873. Debtor said his failure was due to lack of capital, difficulties in connection with the collection of money due to him, costs of suing creditors, keen competition and general depression in trade in the district. The matter was left in the hands of the Official Receiver.

D. J. Spire, Market Place, Bourne, Lincolnshire, electrical engineer.—This debtor's public examination was further adjourned at the Law Courts, Peterborough, recently. According to the statement of affairs returned there were liabilities of £839, with net assets of £491, and a deficiency of £348.

W. A. Jolly (Globe Equipment Co.), dealer in wireless parts and accessories, 36, Foleshill Road, Coventry.—Last day for receiving proofs for dividend, June 5th. Trustee, Mr. C. J. Band, 9-11, High Street, Coventry, Official Receiver.

A. Harrison, electrical engineer and contractor, 110, Town Street, Horsforth, near Leeds.—Receiving order made May 27th on debtor's own petition.

T. O. Lake, electrical factor, "Wayside," Whatton-in-the-Vale, Notts.—First meeting June 7th at 22, Regent Street, Park Row, Nottingham. Public examination July 4th at the County Court House, St. Peter's Gate, Nottingham.

W. A. Beaumont, electrical engineer, 44, Warrengate, Wakefield.—Last day for receiving proofs for dividend June 15th. Trustee, Mr. B. S. Briggs, 13, Burton Street, Wakefield, Official Receiver.

A. J. Barks and **H. Barks** (Barks Bros.), electrical and radio engineers, 10, St. Martin's Lane, Lincoln.—Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver, released May 10th.

Company Liquidations

Halford Radio, Ltd., 39, Sackville Street, W., and Point Pleasant, Wandsworth.—The accounts lodged under the compulsory liquidation of this company show total liabilities of £4,743 (ranking £3,898), assets of £680 absorbed in debenture claims, and a deficiency of £7,400 as regards contributories, the issued capital amounting to £3,502. The Official Receiver, who is also acting as liquidator, reports that the company was formed in April, 1932, to carry on business as manufacturers of and dealers in electrical and wireless apparatus of all kinds. Mr. Julian Halford, the promoter, was also managing director at a salary of £650 per annum plus £350 for expenses. The failure of the company is attributed by Mr. Halford to the slump in trade in 1933 and to the fact that the company was forced to undertake the manufacture of its sets for which it had insufficient capital. Another director considers that high overhead expenses and increasing competition in the trade also contributed to the failure.

Sykes & Dyson, Ltd.—Winding up voluntarily. Joint liquidators, Mr. H. V. Wood, District Bank Chambers, Huddersfield, and Mr. J. E. Sykes, 30, Estate Buildings, Railway Street, Huddersfield.

Reasonable Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. P. C. Harrop, 92, High Street, Brentwood.

Fort Radio, Ltd.—Meeting June 26th at 13, Finsbury Court, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator, Mr. F. W. Inns.

Pantheon Radio, Ltd.—Meeting June 18th at 35, Exchange Chambers, 2, Bixteth Street, Liverpool, to receive an account of the winding-up by the liquidator, Mr. P. S. Booth.

E. Marson, Ltd.—Winding up voluntarily. Liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Dissolution of Partnership

Hermann & Hills, radio and television engineers, Whitecliffe Avenue, and 186, New Road, Copnor, Portsmouth.—Messrs. R. H. Hermann and S. L. Hills have dissolved partnership. Mr. Hermann will attend to debts and carry on the business in his own name.

Electricity Supply

Lighting, Domestic, Power

Amble (Northumberland).—LOWER CHARGE.—A reduction in the lighting flat rate to 4½d. per kWh has been announced by the Urban District Council.

Barking.—SUPPLYING A CINEMA.—The Electricity Committee is to seek sanction to borrow £1,700 in connection with a supply to the Rio Cinema. A l.v. supply is to be given and the charge is to be £4 10s. per kVA of maximum demand per annum plus a fluctuating charge of 0.45d. per kWh based on coal at 16s. per ton.

ELECTRIC DISH-WASHERS.—The Health Committee has asked the architect to report on the desirability of providing electric dish-washers for hospital use.

Beckenham.—BETTER STREET LIGHTING.—The Council has decided to improve the lighting along a number of principal thoroughfares, and to increase the wattage of lamps in all the side streets of Beckenham proper. The annual cost of the improved lighting (£1,544) will be £500 less than originally anticipated owing to a reduction made by the Electricity Committee in the public lighting rate.

Birmingham.—SUB-STATION.—The Electricity Committee is to erect a sub-station in Holyhead Road, Handsworth.

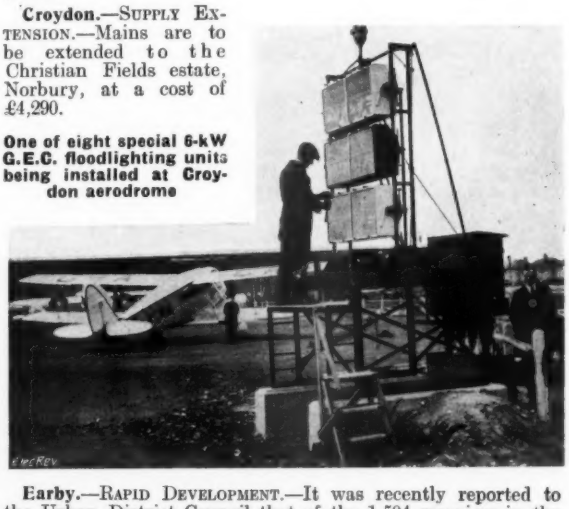
Blackburn.—A YEAR'S PROGRESS.—The annual report of the electricity undertaking, of which Mr. R. H. Harral is engineer and manager, shows that the progress during the past year exceeded that of any previous year. The amount of electricity sold increased by 12.8 per cent. and the maximum load rose by 220 kW to 14,820 kW. The actual amount of electricity sold was 34,032,973 kWh. A large number of domestic consumers were transferred from ordinary lighting and heating rates to the "all-in" domestic tariff; taken together the sales under these two tariffs show a growth of 14.5 per cent. to 9,162,086 kWh. An increase of 10 per cent. in the number of consumers connected is reported. The engineer states that considerable progress has been made during the year in extending supplies to the rural areas, including Mellor, Salesbury and Tockholes, and that farmers have evinced considerable interest in the use of electricity for dairy and poultry-rearing purposes.

Bury (Lancs).—WATER HEATING.—The Town Council has decided to provide householders with water heating cisterns at a rental of 3s. 6d. per quarter.

Calne.—LOWER CHARGES.—The charge for lighting has been reduced by the Town Council to 6½d. per kWh and for power to 2¾d. per kWh.

Coventry.—LOAN.—Sanction is being sought by the Electricity Committee to a loan of £13,570 for new mains and plant.

Croydon.—SUPPLY EXTENSION.—Mains are to be extended to the Christian Fields estate, Norbury, at a cost of £4,290.



One of eight special 6-kW G.E.C. floodlighting units being installed at Croydon aerodrome

Earby.—RAPID DEVELOPMENT.—It was recently reported to the Urban District Council that of the 1,504 premises in the Earby and Kelbrook districts which can be provided with a supply of electricity 926 are now connected. This achievement is particularly praiseworthy as electricity has only been available in Earby for five years, and in Kelbrook since 1933. There are 132 properties in thoroughfares where cables have not yet been laid and fifty-six isolated buildings. Further mains extensions have been authorised.

Eastbourne.—AN EXTENSION OF SUPPLY.—Consent has been received to the erection of the overhead lines necessary to give a supply to Hornscross Paddocks.

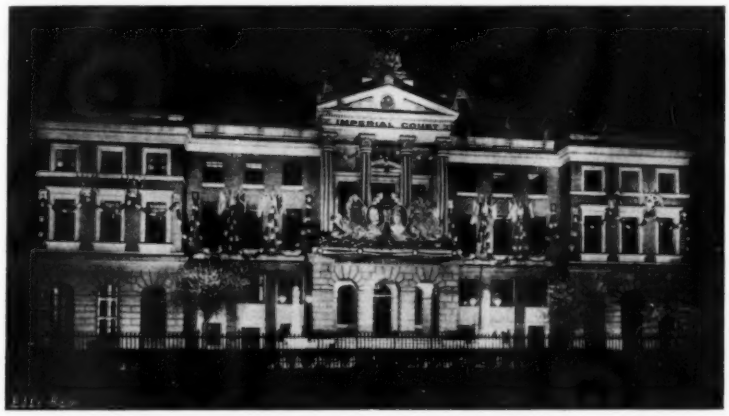
DECORATIVE LIGHTING.—The Council has approved a suggestion to retain the Jubilee decorative lighting until the end of the summer season and to purchase the material which was hired for the occasion and was erected on the Parades and in Devonshire Place. At the request of the Eastbourne Hotels Association the special cheap rate of 2d. per kWh for outside decorative lighting erected in connection with the Jubilee has been extended to apply throughout the year.

Gainsborough.—LOAN.—Application has been made by the Urban District Council for a loan of £6,800 for consumers' wiring installation work and £6,300 for sub-station switchgear.

Giggleswick.—STREET-LIGHTING CONTRACT.—The Parish Council has decided to enter into a three-years' contract with the Settle & District Electricity Co., Ltd., for street lighting. Hitherto the lighting has been by gas.

Glamorgan.—FARMERS' PROTEST.—Complaining that the grid scheme had failed to provide them with supplies of electricity at a reasonable price, the Glamorgan Farmers' Union has sent a resolution of protest to the Union headquarters. It is alleged that the prohibitive cost of electricity in South Wales is not only making it impossible for many farmers to develop their property, but is preventing them from carrying out the various Government schemes with the desired expedition.

Glasgow.—APPARATUS ON HIRE.—The Electricity Committee has approved a proposal to supply a table-type electric cooker, together with a copper kettle, on hire-purchase terms of twenty-four monthly payments of 3s. 9d. each and an installation charge of 10s.



A recent "Beeantee" floodlighting installation at Imperial Court, Kennington, the headquarters of the Navy, Army and Air Force Institutes

NEW MAINS.—Distributing mains are to be laid by the Electricity Department at a cost of £38,590.

Halifax.—STREET LIGHTING.—Mr. G. A. Vowles, borough electrical engineer and manager, informs us that the Street Lighting Committee has accepted the tenders of the Electricity Department for lighting Watkinson Road, Highroad Well and Gibbet Street with filament lamps and Rochdale Road with electric-discharge lamps.

CHEAPER ELECTRICITY.—The Electricity Committee has recommended that the lighting flat rate shall be reduced by ½d. to 5d. per kWh and that the 1,200-kWh limit shall be abolished. In the domestic rate 300 kWh per quarter will be substituted for 250, after which the charge will be lowered from 0.5d. to 0.4d. per kWh.

Hebden Bridge.—LOAN.—The Urban District Council is to apply for sanction to a loan of £1,500 for electrical development work.

Irish Free State.—LIMERICK.—As from May 1st the price of electricity has been reduced from 1½d. to 1d. per kWh for the first 180 kWh in each two-monthly account, and ¾d. per kWh for additional amounts.

Isle of Man.—WIRING INSTALLATIONS.—The Isle of Man Electricity Board has introduced a scheme to provide wiring installations on a rental plan. This applies to dwelling houses and shops requiring between three and twelve lighting points.

A TWO-DAY STRIKE.—On Monday and Tuesday the island was without electricity, due to a strike of members of the Transport and General Workers' Union. Arbitration took place on Tuesday with the I.O.M. Employers' Federation and just before midnight a settlement was reached.

London.—POPLAR.—A block of flats erected at Emmett Street to rehouse people from slum clearance areas has a very imposing appearance at night on account of the special system of verandah lighting, as can be seen in the accompanying photograph provided by the borough electrical engineer, Mr. R. Illingworth. Holophane bulkhead fittings (No. F.639) are built into the underside of the canopy over each verandah.

Luton.—EXTENSION.—An application for sanction to a loan of £43,291 for the extension of h.v. mains has been approved by the Town Council.

Newbury.—HOSPITAL LIGHTING.—It is proposed to install electric lighting at the Isolation Hospital.

New Zealand.—MONOWAI HYDRO-ELECTRIC STATION.—Application is to be made by the Southland Electric Power Board for authority to increase the capacity of the Monowai electric power station by 5,000 kW.

North Tidworth.—PUBLIC LIGHTING.—A special parish meeting held recently decided in favour of an electric street-lighting scheme costing £251.

Rochdale.—CHEAPER ELECTRICITY.—Reductions in tariffs totalling over £6,000 per annum have been authorised. Meter rents have also been reduced.

Scunthorpe.—OFFER REJECTED.—The Urban District Council has decided not to sell its electricity undertaking to the North Lincolnshire & Howdenshire Electricity Co., Ltd.

Seaham Harbour.—SUPPLY EXTENSION.—The Electricity Committee has made arrangements for supplying electricity to forty-six houses at Mount Pleasant, New Seaham.

South Africa.—PROPOSED CAPE TOWN EXTENSIONS.—The City Council proposes to apply for sanction to borrow £1,850,000 for extending the generating capacity of the pooled power stations.

JOHANNESBURG SCHEME.—The Johannesburg City Council has approved further expenditure on the extension of the municipal power station. A sum of £10,746 is to be spent on the purchase of new l.v. switchgear and £11,592 on the construction of an off-loading bay for the power station machinery and plant.

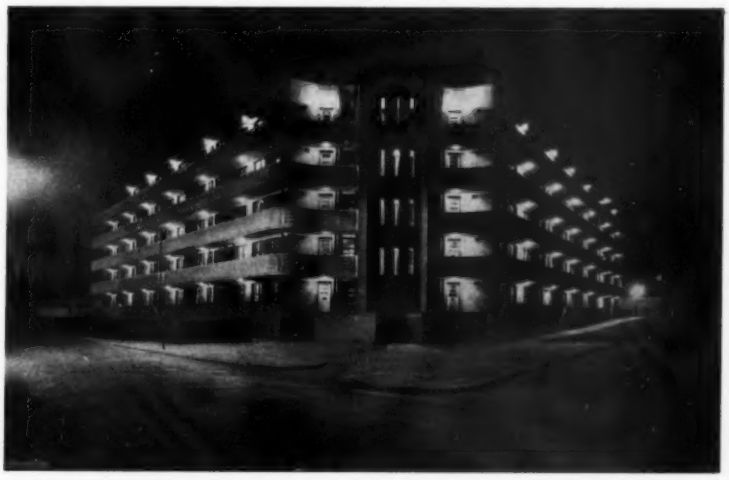
South Cambridgeshire.—COUNCIL HOUSE WIRING.—The Rural District Council has decided to obtain estimates for wiring Council houses with five points where the tenants desire electricity. The supply will be given by the North Metropolitan Electric Power Supply Co., at 8d. per kWh through prepayment meters.

Stoke-on-Trent.—MAINS AND SERVICES.—Sanction is being sought by the Electricity Committee to a loan of £80,000 for mains and services. Mains are to be extended at Fegg Hayes at a cost of £400, and in the Fenton district (£780). The Committee also intends to augment the supply in the New Inn Lane area of Hanford (£400).

Stroud.—VILLAGE SUPPLIES.—The Minister of Transport has communicated with the Member of Parliament for the district regarding electricity supplies to local villages. The position is that the West Gloucestershire Power Co., Ltd., has taken steps to make a supply available to The Butterrow and a suggested extension to Sheepscombe is to be considered. The laying of cables to Edge is not deemed an economic proposition, but the village may be dealt with in conjunction with others in the vicinity.

Swansea.—TIR JOHN CEREMONY.—June 20th has been fixed for the official opening of the Tir John power station. The ceremony is to be performed by Mr. Herbert Morrison, who was Minister of Transport when the Corporation secured the grant for the work and was mainly responsible for inducing the Electricity Commissioners to make the grant.

NEGOTIATIONS UNSUCCESSFUL.—Negotiations between the Electricity Department and Messrs. Baldwins, Ltd., with regard to terms for a supply have proved unavailing, and the company has written to the Committee stating that it has decided to continue generating its own electricity.



A night photograph of the new flats in Emmett Street, Poplar

Traction

Belgium.—UNUSUAL TROLLEY-BUS DESIGN.—The Société des Railways Economiques de Liége-Seraing et Extensions has recently inaugurated a service of electric trolley-buses between Chatqueue, Seraing, and Yvoz-Ramet, a distance of 4¼ miles. The buses are six-wheelers of unusual design, being provided with driver's seats and controls at each end. This arrangement has been adopted because there is no convenient space at the terminal stations to turn the vehicles.

SPECIAL RAILWAY ELECTRIFICATION COMMITTEE.—The Belgian Government has appointed a Special Committee to inquire into the question of the electrification of further sections of the Belgian State Railways, including those between Ostend and Ghent and Louvain and Liége, and the Mons and Luxemburg lines.

Bradford.—TRAMS TO RUN AGAIN.—The abandoned tram route at Thornton is to be reinstated at a cost of £5,533.

France.—PHOTO-ELECTRIC ESCALATOR CONTROL.—On the recently opened "Métro" railway line in Paris a photo-electric cell has been arranged at the foot of the escalators in such a way that the escalator is set in motion whenever a passenger passes, and stops when the person has had time to get to the top. Should other passengers get on in the meantime the escalator will keep working until the last one has reached the top.

Great Britain.—ROAD SAFETY.—Speaking in the House of Commons on Monday, on a vote for £39,098 to complete the sum required for the Ministry of Transport, Mr. Hore-Belisha stated that London experience indicated that the tramcar, taken in conjunction with its track, had a higher accident ratio than the trolley vehicle and was a greater hindrance to the free flow of traffic. The number of accidents involving personal injury per 100,000 car-miles run was slightly over 6 per cent. in the case of trolley vehicles and was over 9 per cent. in the case of tramcars. Although it was less than two years since the London Passenger Transport Board took over responsibility, they had already formulated plans for the substitution of over 40 per cent. of their tramways by trolley vehicles. He was pleased to say that between 1929 and 1934 the mileage of routes operated by trolley vehicles throughout the country had doubled and there were now over 350 miles of trolley routes. Where the routes were suitable for its operation this type of vehicle helped home industries, and particularly the coal trade, in that electricity was still used as the motive power and the load was thus retained. It had the additional advantages of silence, quick acceleration, and freedom from fumes.

Interior of the new radio station at Saint Nazaire

Italy.—RAILWAY ELECTRIFICATION.—The entire 160-mile system of the North Milan Railway from Milan to the shores of Lakes Como and Maggiore is to be electrified. This decision has been influenced by the successful operation of the Milan-Saronno and Milan-Meda sections, totalling 31 miles, which have been electrically worked on the 3,000-V d.c. system since 1929.

Leicester.—NEW OFFICES.—It is proposed to erect new offices for the Tramways Department at Abbey Park Road. The cost is estimated at about £20,000.

Salford.—TRAM TRACK RENEWAL.—The tramway tracks at the junction of Cross Lane and Regent Roads and between Salford Royal Hospital and Windsor Bridge are to be relaid at a cost of £3,500 and £6,546 respectively.

South Africa.—JOHANNESBURG TRANSPORT CHANGES.—It is probable that, with one exception, tramcars will have disappeared from the south suburbs of Johannesburg by July 1st, and that their places will have been taken by omnibuses. It is not expected that the trolley-buses which are to be tried on the north suburban route will be ready before the end of the year.

TRAFFIC SIGNAL STATISTICS.—The number of roadway intersections controlled by automatic signalling apparatus in the Union is now 131, time-operated installations accounting for 114 of this total, and vehicle-operated for seventeen. Johannesburg has sixty-two, Durban sixteen, and Pretoria eleven.

Sweden.—ELECTRIFICATION FIGURES.—Approximately 1,320 route-miles of the State railway are now electrified on the single-phase system, and a further 250 miles will be converted by the beginning of 1936. The total cost of conversion, including the 250 miles on which work is in progress is about 226 million Swedish kr., and at present the energy consumption amounts to 330 million kWh a year.

Communications

Australia.—BROADCASTING STATION FOR SOUTH PACIFIC.—A broadcasting station, the equipment for which is supplied by Amalgamated Wireless (Australasia), Ltd., is being erected at Port Moresby, Papua. This will be the first broadcasting station to be erected in the South Pacific Islands.

China.—NATIONAL TELEPHONE AND TELEGRAPH NETWORK.—In the course of a recent address Dr. Chu Chia-Hua, the Chinese Minister of Communications, stated that the construction of telephone trunk lines to afford direct communication between any two principal cities in Kiangsu, Chekiang, Anhwei, Kiangse, Hupeh, Hunan, Honan, Shantung and Hopei was expected to be completed before the end of the year. With a view to facilitating communications with the North-Western provinces of China, the original scheme would be extended so as to cover Sian, Taiyuan, and Lanchow. In addition, branch telephone lines would be installed in Anhwei and Honan, and trunk lines were being constructed between Wanhsien and Chungking. The Ministry was contemplating the establishment this year of direct radio communication with India, Australia and Canada. Further, in consideration of the large number of international telegrams from or to Tientsin, Tsingtao and Hankow, medium-powered automatic transmitting and receiving stations would be set up in these places to communicate directly with Japan, the Philippines, and French Indo-China. Twelve more radio-telephone stations would be installed in remote parts of China, and this would complete the first stage in the development of national telephone network.

France.—TELEPHONE SERVICE TO TOKIO.—A *Reuter* message from Paris says that a direct wireless telephone service between Paris and Tokio is to be opened shortly.

A NEW WIRELESS STATION.—The Post Office has just inaugurated a new radio-transmitting and receiving station at Saint Nazaire for communication with ships. It will replace the service now conducted by Radio Havre. When the station is completed, in about two years' time, it will be of the multiplex type, sending and receiving simultaneously on several wavelengths. For the present the service will normally operate on a wavelength of 2,439 metres and will use 2,100 metres between the thirtieth and thirty-fifth minutes after each even hour. Radio telegrams are to be sent on 2,884.6 metres. The transmitting and receiving stations are about eighteen miles apart and are connected by an underground cable. The normal power furnished to each antenna of the transmitting equipment at Severac is 15 kW, the energy being provided by a battery of lead-storage cells of 3,000 Ah at 220 V, charged by a generator driven by a 200-h.p. Diesel engine. Eventually the plant is to be connected to the three-phase 20,000-V line which runs nearby. The receiving station is at Donges, the electricity being obtained from the 20,000-V lines of the Basse Loire Co. Should the supply fail the service will be fed by a three-phase alternator driven by a 50-h.p. Diesel engine. A short-wave telegraph transmitter is being installed at Severac which will develop a power of from 15 to 20 kW. Reception will be by two 20-valve short-wave sets. This work is to be completed during the present year, and the installation of sets permitting bilateral radio-telephonic communication is expected to be done some time next year.

Germany.—TELEVISION.—It has been announced in Berlin that the Olympic Games which will take place next year will be broadcast in Germany by television. A special television conference was held last week in the Broadcasting Company's headquarters, when, according to the *Manchester Guardian*, a special television broadcast of part of the German Olympic team at practice was given by intermediate film transmission. The athletes had been filmed at the Berlin Sport Club with a cinematograph apparatus. Within one minute the film had been developed, fixed, and prepared.

TELEPHONY WITH CHINA.—The first telephone call between Germany and China was made last week as a preliminary test for the wireless telephone service.

Hull.—MUNICIPAL TELEPHONES.—It is reported that a net profit of £19,963 was made by the municipal telephones during the last twelve months. The manager states that the number of new subscribers was greater than during any previous year. The Government royalty tax amounted to £12,463, making a total sum of £224,479.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—SYDNEY.—August 12th. Municipal Council. 11,000-V oil-immersed isolating and earthing switches. (A.Y. 13087.)*

Beckenham.—June 24th. U.D.C. Coal supply. (May 31st.)

Belfast.—June 11th. Electricity Department. 11-kV outdoor type switchgear, transformers, &c. (May 31st.)
June 22nd. Switchgear, cables, overhead transmission line, overhead switching equipment. (See this issue.)

Belgium.—BRUSSELS.—June 22nd. Two mercury rectifiers and one static transformer for the Brussels Port sub-station. Société du Canal et des Installations Maritime de Bruxelles, 59, Rue du Canal.

Bolton.—June 11th. Housing Department. Electrical installations in 174 houses, bungalows, and flats. (May 31st.)

Bridlington.—June 12th. Corporation. Meters, fuse and joint boxes, and lamps, for the period ending March 31st, 1936. (May 31st.)

Brighouse.—July 15th. Corporation. Wiring of houses under the hire-purchase wiring scheme during the year ending August 31st, 1936. Electrical engineer, Huddersfield Road.

Bristol.—Port of Bristol Authority. One 6-panel, 6,600-V h.p. compound filled switchboard. W. P. Wordsworth, chief engineer, Avonmouth Docks (deposit £2 2s.).

Carlisle.—June 17th. City Council. Electrical installations in 196 houses. City surveyor, 18, Fisher Street.

Croydon.—June 21st. Electricity Department. Stores and materials for the year commencing August 1st. (May 31st.)

Dartford.—June 11th. Corporation. 11-kV cable and joint boxes. (May 31st.)
June 22nd. Meters. (See this issue.)

Dumfries.—June 10th. County Council. Wiring for electricity of seven schoolhouses, the infectious diseases hospital at Thornhill and Rowantree House, Gatelawbridge. J. Robson, County clerk, County Buildings.
June 17th. Various works, including electrical, at Lauriekinowe school. J. Robson, County clerk.

Ealing.—June 21st. Electricity Department. Stores and materials for the year ending July 31st, 1936. (See this issue.)

East Grinstead.—June 14th. U.D.C. Electric cookers. (May 31st.)

Edinburgh.—June 10th. Electricity Department. Extensions to water circulating system at Portobello station. (May 31st.)

Egypt.—CAIRO.—June 29th. Public Works Ministry. Electrical material, including lamps, insulators, fuses, meters, battery plates, street lanterns and poles. (A.Y. 13091.)*

Exeter.—June 12th. City Council. Electrical installation at Electricity House. J. Bennett, city architect.

Formby.—June 11th. U.D.C. 400-kVA three-phase indoor transformer. A. Holmes, clerk of the Council, Council Offices.

Hawarden.—June 12th. R.D.C. Prepayment and ordinary type meters. (May 24th.)
Electricity Department. Four 11-kV 400-V transformers. (May 31st.)

Houghton-le-Spring.—U.D.C. Electric lighting installation at thirty houses on the Newtown estate. V. J. Hunter, surveyor, Council Offices.

India.—July 2nd. India Store Department. Indoor and outdoor switchgear. (May 31st.)
June 12th. Bombay, Baroda and Central India Railway Co. Copper wire. (May 31st.)

Irish Free State.—MALLOW.—June 22nd. North Cork Board of Health and Public Assistance. Electric lighting and power services in the new County Hospital. D. C. Murphy, Secretary's Office, County Hospital (deposit £20).

Kingston-on-Thames.—June 14th. Town Council. Street fire alarm system. (May 31st.)

Kirkby-in-Ashfield.—June 15th. U.D.C. Two sets of electrically driven pumps for the waterworks pumping station, East Kirkby. G. H. Green, clerk to the Council, Public Offices, Urban Road (deposit £2 2s.).

Lanark.—June 11th. County Council. Various works, including electric lighting, at ninety-two houses. P. C. Smith, county housing and town planning engineer, 13, Clydesdale Street, Hamilton.

London.—FULHAM.—June 24th. Borough Council. For the extension of Townmead Road power station:—Section "A.A.": Two storage batteries of 1,000 and 50-Ah capacity respectively with motor-generator, rectifiers, &c. Section "A.B.": Boiler-house auxiliaries comprising electrically driven forced and induced draught and secondary air fans, with control apparatus, switchgear, &c. Borough treasurer, Town Hall (deposits of £5 for section "A.A.," and £10 for section "A.B.").
June 24th. Borough Council. Coal conveying plant and cable. (May 31st.)
METROPOLITAN WATER BOARD.—June 17th. Electric lamps for periods of six and twelve months commencing August 1st (tender No. 24). Chief engineer, Offices of the Board, 173, Rosebery Avenue, E.C.1.
DEPTFORD.—June 26th. Borough Council. Electrical installations in 110 houses on Brockley Estate. (May 31st.)
BETHNAL GREEN.—June 18th. Borough Council. Installation of rising mains at tenement buildings. (May 31st.)

Maldens & Coombe.—June 24th. U.D.C. Street lighting. (See this issue.)

Manchester.—June 29th. Electricity Committee. A.c. 15,000-V testing equipment and one mercury-arc rectifier equipment. (See this issue.)

Middlesbrough.—June 17th. Electricity Department. Twelve months' supply of 660-V cable. (May 31st.)

Middlesex.—July 5th. County Council. Engineering works, including boilers, calorifiers and auxiliaries, electric generating sets and water softening plant for the County Sanatorium, Harefield. E. Hart, clerk of the County Council, Guildhall, Westminster, S.W.1, by June 11th (deposit £2 2s.).

Midlothian.—June 11th. County Council. Various works, including electrical, at sixty-six houses at Wallyford. County architect, 10, Drumsheugh Gardens, Edinburgh.

New Zealand.—WELLINGTON.—July 17th. Post and Telegraph Department. 5,000 telephones. (A.Y. 13080.)*
July 30th. Telephone receivers, &c. (A.Y. 13108.)*
August 1st. P.b.j. wire. (A.Y. 13103.)*
August 2nd. Telephone cable. (A.Y. 13094.)*
August 5th. L.c. telephone cable. (A.Y. 13096.)*
August 6th. Junction blocks for telephone cables. (A.Y. 13109.)*
August 8th. Porcelain insulators. (A.Y. 13100.)*
August 12th. V.i.r. wire. (A.Y. 13095.)*

Norwich.—June 15th. City Council. Heating and domestic hot water systems and electric lighting at three buildings at the Hellesdon Mental hospital. City engineer, Guildhall (deposit £1 in each case).

St. Andrews.—June 18th. Town Council. Various works, including electrical, at 120 houses. Walker & Pride, architects, Church Square (deposit £1 1s.).

Seaham Harbour.—U.D.C. Electric wiring of 150 houses on the Deneside estate. J. C. Edington, clerk to the Council.

South Africa.—GRIQUATOWN.—Municipality. July 4th. Electrical generating plant, switchgear, distribution and consumers' equipment. (A.Y. 13089.)*
JOHANNESBURG.—Railways and Harbours Administration. July 15th. Fourteen electrically driven jib cranes for Port Elizabeth harbour. (A.Y. 13090.)*
July 29th. 15-ton electrically driven jib crane. (A.Y. 13101.)*
ELECTRICITY SUPPLY COMMISSION.—August 8th. Eight sub-station equipments, comprising h.p. switchgear, mercury arc rectifying plant and track feeder switchgear, in connection with the Reef railway electrification scheme.

Southend-on-Sea.—July 4th. Borough Council. Electrical work at the Sutton Road housing estate. A. C. Johnson, engineer and manager, Municipal Buildings, Clarence Road.
July 4th. Electricity Department. Transformers and switchgear. (See this issue.)

South Shields.—June 15th. Electricity Supply Department. Electric wash-boilers. (See this issue.)

Spalding.—June 22nd. Electricity Department. E.h.p. cable and joint boxes. (See this issue.)

Stanhope (DURHAM).—U.D.C. Supply of electricity to the village of St. John's Chapel. E. C. Lennox, North-Eastern Electric Supply Co., Ltd., Carliol House, Newcastle-upon-Tyne.

Swansea.—July 1st. Electricity Department. One 750-kW Diesel engine and alternator. (See this issue.)

Taunton.—June 24th. Electricity Department. Glass bulb rectifier equipments. (See this issue.)

Thornton Cleveleys.—June 19th. U.D.C. H.p. and l.p. cables. (See this issue.)

Wallasey.—June 17th. Corporation. Cables and meters for the year ending June 30th, 1936. (May 31st.)

Walton and Weybridge.—June 17th. Electricity Department. One 300-kVA transformer. (May 31st.)

West Hartlepool.—June 13th. Electricity Department. H.p. and l.p. cables for twelve months. (May 31st.)

West Riding.—June 24th. County Council. Electric lighting at Common Road Council school, South Kirkby, and Park Road senior mixed Council school, Wath-upon-Dearne. Education officer, County Hall, Wakefield.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—Accepted. Electrical work in connection with the alterations at Ferryhill School (£548).—A. B. Robertson & Son, Ltd.

Australia.—COMMONWEALTH.—P.M.G.'s Department. Accepted. Underground cable.—Standard Telephones & Cables (Australia), Ltd.; Callender's Cable & Construction Co., Ltd.; Pirelli-General Cable Works, Ltd. Hand sets.—Ericsson Telephone Manufacturing Co. (£323); Automatic Telephones, Ltd. (£663); Siemens (Aust.) Pty., Ltd. (£299). Plugs and sleeves (£414).—Telephone Manufacturing Co. Loading-coil pots.—Salford Electrical Instruments, Ltd.; British General Electric Co., Ltd. Radio and electrical instruments for R.A.A.F.—Siemens (Aust.) Pty., Ltd.
VICTORIA.—MELBOURNE.—City Council. Accepted. Stator windings and pyrometer equipment (£773).—Siemens (Aust.) Pty., Ltd.
Metropolitan Tramways Board. Tramcar cable (£614).—W. T. Henley's Telegraph Works Co., Ltd.

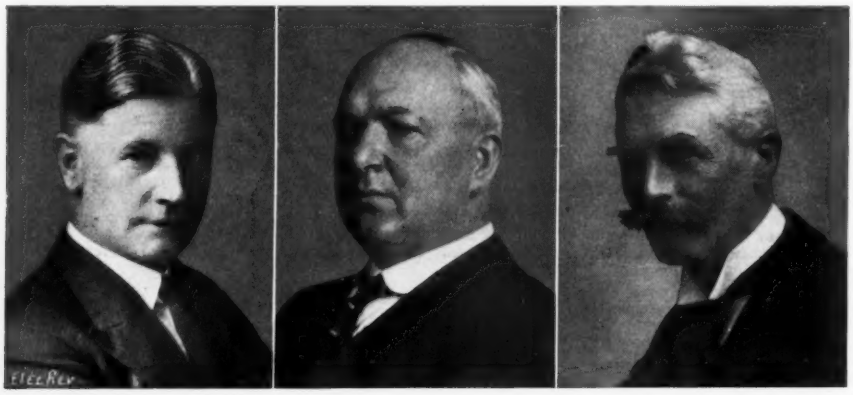
Banbury.—R.D.C. Accepted. Automatic electric pumping plant (£495).—G. C. Pillinger & Co.

Barking.—Electricity Committee. Recommended. Three 250-kVA transformers (£367).—Yorkshire Electric Transformer Co., Ltd. Switchgear.—Crompton Parkinson, Ltd. (£245); Metropolitan-Vickers Electrical Co., Ltd. (£164); Harland Engineering Co., Ltd. (£72).

Birkenhead.—Watch Committee. Accepted. Cables (£1,612).—Macintosh Cable Co., Ltd.

Boldon (Co. DURHAM).—Parish Council. Accepted. Electric street lighting at Whiteleas and West Boldon.—F. Reid, Ferens & Co.

Bradford.—Electricity Committee. Recommended. D.c. traction switchboard.—Bertram Thomas. D.c. traction feeder panel.—English Electric Co., Ltd.



Speakers in Wednesday's discussion at Bournemouth (reported on page 816).—Messrs. J. C. Dalton, P. J. Robinson and H. Marryat. (*Photos by Elliott & Fry.*) (Continued below)

Durham.—County Education Committee. Accepted. Electrical installations at schools.—Falconar Cross & Co. (£534); F. Reid, Ferens & Co. (£193); E. & H. Glover (£98); Devereux Moodie & Co., Ltd. (£86); Seymour & Warren (£180).

Essex.—Public Assistance Committee. Accepted. Electric lighting at Maldon Institution (£247).—Essex Electrical Installations, Ltd.

Guildford.—Electricity Committee. Recommended. Cables.—Standard Telephones & Cables, Ltd.; Craigpark Electric Cable Co., Ltd.

Ilford.—Electricity Committee. Accepted. Electric van (£220).—F. G. Smith (Motors), Ltd. Transformers.—British Electric Transformer Co., Ltd. (£543); Ferranti, Ltd. (£445).

Maternity Committee. Accepted. Electric lighting at maternity home (£1,359).—J. F. Benton.

Irish Free State.—NAAS.—Kildare Board of Health. Accepted. Electrical installations at new fever hospital (£1,266).—Bective Electrical Co.

London.—London and Home Counties Joint Electricity Authority. Accepted. Twelve months' supply of electrical fittings.—Drake & Gorham (Wholesale), Ltd.

L.C.C. Education Committee. Accepted. Electrical installations: at Turnham school, Lewisham (£815)—J. L. Shadwell; at Westhorne school, Woolwich (£920)—Star Electrical Co., Ltd.

Morecambe.—Electricity Committee. Accepted. One 400-kVA transformer.—Electric Construction Co., Ltd. Four switchboards.—Crompton Parkinson, Ltd.

Salford.—Light, Heat and Power Committee. Accepted. Two new main covers for 12,500-kVA transformers at the Agecroft power station (£150).—Metropolitan Vickers Electrical Co., Ltd. 33-kV feeder cables and l.p. pilot cables from Agecroft power station to West Street sub-station, Pendleton (£11,126).—W. T. Glover & Co., Ltd.

Wallasey.—Electricity Committee. Accepted. 250-kVA transformer.—Yorkshire Electric Transformer Co., Ltd.

Wimbledon.—Electricity Committee. Accepted. Replacing circuit-breakers at sub-stations (£3,000).—A. Reyrolle & Co., Ltd.

York.—Electricity Committee. Accepted. Cables (£4,645).—Callender's Cable & Construction Co., Ltd. Re-plating batteries (£454).—Britannia Batteries, Ltd.

Notes

Atmospheric Pollution

Thirty-six representatives of local authorities and other organisations co-operating with the Department of Scientific and Industrial Research in the investigation of atmospheric pollution met on May 27th for the half yearly conference at the offices of the Department. A report was received from Dr. G. M. B. Dobson, F.R.S., on the progress of the researches carried out under the Atmospheric Pollution Research Committee. Dr. Dobson informed the conference that a full-time investigator had been appointed by the Department as a preliminary to the undertaking of an intensive survey, at a selected centre, of various types of pollution with a larger number of instruments. The method developed at the Building Research Station for estimating sulphur in the atmosphere was now being adopted more widely by the local authorities. Further experiments combined with weather observations were being taken in hand to facilitate the interpretation of the data collected by means of the deposit gauge observations.

A Belgian Electrical Association's Jubilee

The completion of the first fifty years of the Société Belge des Electriciens was recently celebrated by a special meeting held in Brussels, which was attended by several members of the Belgian Government and a number of prominent scientific men. Papers were read by M. Sadzot, the Director-General of the Belgian Telegraphs and Telephones, M. Uytborck, and by M. Duquesne, chief engineer of the Ateliers de Constructions Electriques de Charleroi.

A Marcel Deprez Jubilee Celebration

The Société Française des Electriciens is making arrangements to celebrate in Paris next November the jubilee of the first experiments in the transmission of electric energy by M. Marcel Deprez in 1885-86.

Melting Time of Thin Fuses

The formula $t = C(q/I)^2$ for the melting time of fuses (t = time in seconds; q = section in sq. cm.; I = short-circuit current in ampères) has hitherto been experimentally confirmed only for thick fuses, says *Elektrotechnische Zeitschrift*. Investigations by Van Liempt and de Vriend, using a cathode-ray oscillograph, show that the same equation applies to thin fuses such as used in lamp circuits, if the short-circuit current is about twice the limiting current of the fuse. The values given for the constant C are as follows:—

	C×10⁻⁶		C×10⁻⁶
Copper	1,000±67	Manganese nickel ...	244±17
Silver	716±38	Constantan	135± 6
Platinum	234±10	Monel	150± 8
Tin	46± 1.5	Kruppin	81± 3
Nickel	234± 7	Tin with 1.8% lead ...	53± 2.5

Appointments Vacant

Assistant mains engineer for Norwich Electricity Department.

Junior assistant for Eastbourne Electricity Department.

Shift charge engineer for Heston and Isleworth Electricity Department.

Engineer's assistant for Park Prewett Mental Hospital.

(See our classified advertisements.)

Makers' Names Wanted

HORNBY imitation gold contact tips.

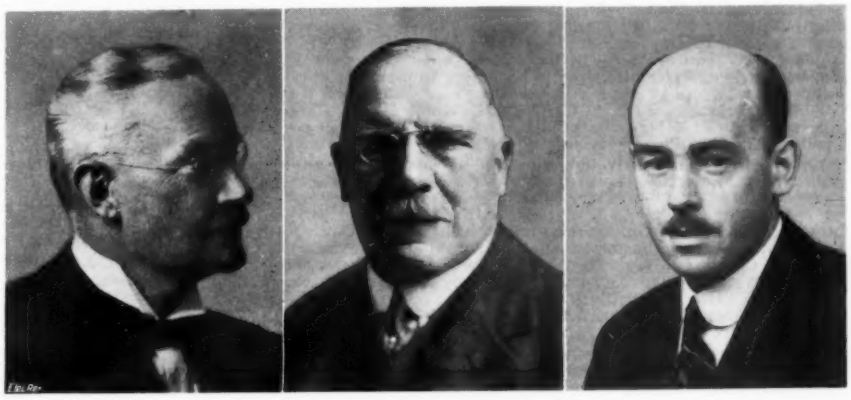
SIECOLUX decorative shades.

Sir Archibald Page (*Elliott & Fry*), **Sir Felix Pole** (*Lafayette*), **Sir John Brooke** (*Bassano*), **and Sir William Ray** (*Lafayette*)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

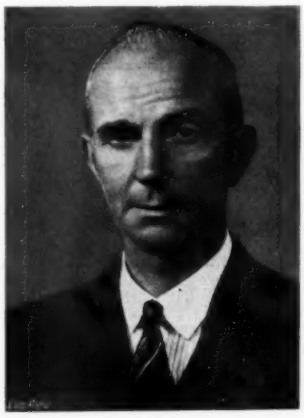
The Honours List.—As was anticipated, the Jubilee and Birthday Honours List, which was published on Monday last, is considerably longer than usual. It includes the names of several gentlemen prominently connected with the electrical industry. **Sir Arthur Balfour,** Bt., K.B.E., LL.D., is created a baron for public services, and **Dr. S. L. Pearce,** C.B.E., D.Sc., engineer-in-chief of the London Power Co., Ltd., receives a knighthood. **Mr. Noel Ashbridge,** chief engineer of the British Broadcasting Corporation, who was also a member of the Television Committee which visited the United States last year, is knighted, and **Mr. L. Hore-Belisha,** M.P., Minister of Transport, becomes a Privy Councillor. **Mr. H. E. Wimperis,** C.B.E., M.I.E.E., who receives the K.B.E. (Military Division), is the Director of Scientific Research with the Air Ministry. **Mr. F. W. Phillips,** Director of Telecommunications, G.P.O., receives the C.M.G. **Prof. J. C. M'Lennan,** O.B.E., F.R.S., Professor Emeritus and Visiting Professor of Physics, University of Toronto, becomes a K.B.E. in recognition of fundamental discoveries in physics and for his scientific services. The O.B.E. (Civil Division) is awarded to **Mr. J. W. Kitto,** Deputy Director of Posts and Telegraphs, New South Wales; **Prof. G. B. Bryan,** D.Sc., M.I.E.E., Professor of Physics, Royal Naval College, Greenwich; **Mr. A. E. Coombs,** telephone district manager, Glasgow; **Mr. A. C. Pallot,** M.I.E.E., assistant engineer, Grade I, H.M. Office of Works; and **Mr. G. A. H. Wootton,** A.M.I.E.E., lately Engineer-in-Charge, New Scotland Yard. **Mr. E. Marsden,** M.C., Secretary of the Department of Scientific and Industrial Research, New Zealand, receives the C.B.E., and **Mr. J. M. Crawford,** Chief Engineer, Postmaster-General's Department, Australia, becomes a M.B.E. In the India Office List, **Major H. G. Howard,** M.C., Chief Engineer for Electricity, Madras, is awarded the C.I.E., and **Mr. Krishnaswami Chetti,** electrical engineer to the Madras Corporation, is given the M.B.E.



In the Honours List.—Dr. S. L. Pearce (*Swaine*), Sir Arthur Balfour, Bt. (*Elliott & Fry*), and Mr. Noel Ashbridge.

Sir Giles Gilbert Scott, architect of the Battersea power station, has been given the first award of the Tylers' and Bricklayers' Company for the brick building judged to have the most merit within the R.I.B.A. radius of eight miles from Charing Cross. Buildings completed in the three years ended December 31st last were eligible, and the power station was chosen for the distinction out of a large number of entries.

Mr. J. Fisher, charge engineer with the Halifax Corporation Electricity Department, has been appointed charge engineer with the Blackpool electricity undertaking. Mr. Fisher has been at Halifax for seven years, and recently has been acting as technical assistant.



[*Ellis, Glasgow*

Mr. H. G. Mackerron

Mr. H. G. Mackerron, whose election as president of the Electrical Contractors' Association of Scotland was reported in our last issue, was educated at Downhill School and the Royal Technical College, Glasgow. He served his apprenticeship with Messrs. Claud Hamilton, Ltd., Glasgow, after which he was for about ten years with Messrs. J. B. Meiklejohn, Ltd. He was appointed manager to Messrs. Anderson & Munro, of Glasgow, and held this position for eleven years, starting in business on his own account in 1923. He is now a director of Messrs. Mackerron & Scott, Ltd., electrical engineers and contractors, of Glasgow.

During his tour to the British Industries Fair the Prince of Wales visited the stand of Messrs. Ferranti, Ltd., where he was received by **Mr. C. W. Bridgen.** His Royal Highness was particularly interested in the company's range of electric water heaters.

Mr. G. C. Sofiano, for nearly ten years with Messrs. Crompton Parkinson, Ltd., has resigned from that company to become sales engineer with Mr. E. W. Walker, Birmingham district agent for the Electric Construction Co., Ltd.

Mr. D. Krestin, B.A., has been appointed London sales manager for Alklum Storage Batteries, Ltd., Halifax, whose London office is at 33, Chandos House, Buckingham Gate, S.W.1.

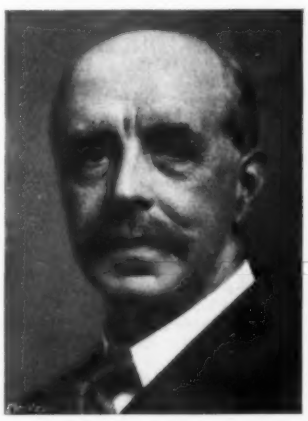
Mr. A. J. Phillips, installation superintendent in the Huddersfield Corporation Electricity Department, who has retired after nearly forty years' service with the undertaking, has been presented by the staff with an electric clock and a wallet of treasury notes. The presentation was made by Mr. J. W. Turner, the manager of the Electricity Department.

Bailie R. Scott Irvine was unanimously reappointed chairman of the Ayrshire Electricity Board at the recent annual meeting of the Board.

Obituary

Mr. E. C. Reed.—We regret to record the death, which occurred on Sunday last, of Mr. E. C. Reed, for many years publicity manager to Messrs. Edward Bennis & Co., Ltd., and editor of *Cheap Steam.*

Mr. C. N. Staniland.—We regret to record the death of Mr. Charles Norman Staniland, electrical engineer to the Hornsey Borough Council, which occurred suddenly on Friday last while he was in a train near Exeter. Mr. Staniland, who was sixty-three years of age, went to Hornsey as clerk of works in 1901, during the construction of the power station, and was appointed resident engineer in 1903. He became an associate of the I.E.E. in 1897, an associate member in 1899, and a full member in 1908.



[*Valentine Gibbs*

The late Mr. C. N. Staniland

Mr. E. L. Pope.—We regret to announce the sudden death of Edwyn Lonsdale Pope, which occurred at Holt, Norfolk, on Monday, June 3rd. Born in 1868 and educated privately, he served his time under the late Mr. Frank King with the Electrical Power Storage Co. at Millwall, being engaged on the installation of batteries and switchgear in the sub-stations and power house of the Chelsea Electric Supply Co. at Draycott Place. On completion of the installation he transferred to the Chelsea Co. as assistant engineer. After some years there, he became one of the outdoor engineers to Callender's Cable & Construction Co., with whom he remained until 1902, when, having installed a large proportion of the distribution cables in connection with the initial sections of the L.C.C. tramways on behalf of his firm, he was appointed assistant to Mr. Rider, the engineer-in-chief to the L.C.C. tramway undertaking. He remained with the L.C.C. as distribution engineer until June, 1919, when he was compelled to retire owing to ill-health. Since his retirement he had lived quietly at Holt, Norfolk, where he was interested in dogs, and won a large number of prizes at shows. He was a member of the I.E.E. for about forty years. He leaves a widow and one son.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Ultra Electric (Holdings), Ltd.—Public company. Registered May 29th. Nominal capital, £250,000 in 5s. shares. The objects are to adopt an agreement with A. E. Rosen and A. W. R. Farrer for the acquisition by this company of the whole of the issued share capital of Ultra Electric, Ltd., from the shareholders of that company; to hold all the shares acquired under such agreement; and to carry on the business of financiers, &c. The subscribers are: M. V. Baron, 28, Mortimer Court, St. John's Wood, N.W.8; J. Perrett, 125, Burnt Oak Lane, Sidcup; and five clerks. Solicitors: Herbert Baron & Co., 9, Queen Victoria Street, E.C.

Galashiels Relay, Ltd.—Private company. Registered in Edinburgh May 27th. Capital, £1,500 in 1,350 deferred ordinary and 150 participating preferred ordinary shares of £1 each. Objects: To acquire from Bryan Groom and Alexander T. Roberts all licences or other rights belonging to them for operating a wireless relay system in the Burgh of Galashiels, &c. The first directors are: B. Groom, 159, Wood Street, Galashiels, and A. T. Roberts, Riverhall, Wadhurst, Sussex. Registered office: Hall Place, Galashiels.

Traindicators, Ltd.—Private company. Registered May 30th. Capital, £3,000 in 1,000 7½ per cent. participating preference shares of £1 and 8,000 ordinary of 5s. each. Objects: To adopt an agreement with V. A. L. Paton and F. Hill, and to carry on the business of manufacturers and merchants of automatic electric departure indicators and other automatic devices, advertising agents and contractors, &c. The first directors are: F. Hill, 78, Cambridge Terrace, W.2, and V. A. Loftus Paton, 10, Stanhope Gardens, S.W.7. Secretary: A. W. Smith, 23, Glamorgan Road, Hampton Wick. Registered office: 10, Sackville Street, W.

William Oakley, Ltd.—Private company. Registered May 30th. Capital, £2,000 in £1 shares. Objects: To carry on the business of engineers and electrical conduit fitting manufacturers mentioned in an agreement with W. H. Oakley and E. J. Trawford, trading at Wolverhampton Road, Walsall, as "William Oakley." The first directors are M. H. Oakley, 101, The Crescent, Walsall, and E. J. Trawford, Bylanes, Park Road, Walsall. Secretary: Miss D. Allen, 4, Silver Street, Walsall. Solicitors: E. Irwin Miller & Son, Walsall.

L.B. & D. Electrical Co., Ltd.—Private company. Registered May 30th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in artificial lighting apparatus, electric, gas and oil lamps, quartz lamps, reflectors, bells, &c. The permanent directors are H. Davis, 8, City Road, E.C.1, and S. Davis, 23, Edgeworth Avenue, Hendon, N.W.

Wetherill & Barnes, Ltd.—Private company. Registered May 31st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and television sets, artificial lighting apparatus, &c. The directors are. J. E. Wetherill, 16, High Street, Wetherby, Yorks; and J. F. Barnes, 11, Park View, Harrogate. Solicitors: Granger & Neild, Leeds.

Manchester Armature Repair Co., Ltd.—Private company. Registered May 29th. Capital, £7,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers and repairers of electrical apparatus and appliances, &c., and to acquire all or part of the business, property and liabilities of M. A. R. (Holding) Co., Ltd. The first directors are: R. N. Ainsworth, Crafnant, Stafford Road, Eccles, and two others. Registered office: Ford Lane, Pendleton, Salford.

Cable Covers, Ltd.—Private company. Registered May 29th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in electric cable covers, ducts, troughings, conduits, pipes, &c. The directors are: R. H. Wheeler, The Old Court House, Hampstead Heath, N.W., and three others. Registered office: St. Stephen's House, Victoria Embankment, Westminster, S.W.1.

South Wales Relay Central Exchanges, Ltd.—Public company. Registered May 27th. Nominal capital, £100,000 in 1s. shares. The objects are to establish, maintain and develop services for the relaying of radio programmes to subscribers and others, to acquire the whole of the shares in Pontypridd Radio Central Exchange, Ltd., Merthyr Radio Central Exchange, Ltd., Bargoed R.C.E., Ltd., and Rhondda Radio Central Exchange, Ltd., and in particular to purchase from Radio Central Exchanges, Ltd., A. B. Winch and G. B. Winch all the shares owned by them in the four above-mentioned companies. The first directors are: A. B. Winch, Broomhall, Broadbridge Heath, Sussex; and J. G. Young, Stenfield, Bickley, Kent. Registered office: 10, Market Street, Pontypridd, Glam.

Returns of Electrical Companies

Calcutta Electric Supply Corporation, Ltd.—The nominal capital has been increased by the addition of £1,000,000 in £1 unclassified shares beyond the registered capital of £4,000,000.

Igranic Electric Co., Ltd.—The nominal capital has been increased by the addition of £20,000 in £1 ordinary shares beyond the registered capital of £115,000.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.—Satisfaction in full on August 15th, 1934, of trust deed dated October 12th, 1923, and registered October 24th, 1923, securing £150,000 income debenture stock. (Notice filed May 21st, 1935.)

Clang, Ltd.—Particulars filed of £1,500 debentures authorised May 17th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Space Heating, Ltd.—Debenture dated May 18th, 1935, to secure £190 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. H. Wheab, 20, Bilston Grove Avenue, Harrogate.

Automatic Internal Telephones, Ltd.—Particulars filed of debentures not exceeding £5,000 authorised April 17th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,500.

Watford Electric & Manufacturing Co., Ltd.—Further charge on freehold land, works and buildings in Whippendell Road, Watford, dated May 24th, 1935, to secure £3,600. Holder: G. Longley, Apsley Lodge, Clarendon Road, Watford. (The charge upon the above property ranks in priority to the charges conferred by the debentures dated May 31st, 1923, and August 22nd, 1929.)

Architectural Lighting, Ltd.—Debenture dated May 8th, 1935, to secure £1,000 charged on the company's undertaking and property, present and future. Holder: Viscount Long of Wraxall, 16, Gloucester Place, W.1.

E. R. Morton, Ltd.—Capital, £1,000 in £1 shares. Return dated November 4th, 1934 (filed April 27th, 1935). 502 shares taken up. £502 paid. Mortgages and charges, nil.

Phœnix Dynamo Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated December 24th, 1934. Two shares taken up. £2 paid. Mortgages and charges, nil.

Varsity Eliminator Co., Ltd.—Fredk. G. Grubb, of 30, King Edward's Gardens, Acton Hill, was appointed receiver on May 17th, 1935, under powers contained in debenture dated January 28th, 1935.

Joseph Boyce, Ltd.—Arthur J. Weaver, of 77, Victoria Street, Grimsby, was appointed receiver and manager on May 28th, 1935, under powers contained in instrument dated November 15th, 1932.

G. R. Saunders & Co., Ltd.—F. R. Turner, of 56, Chasefield Road, S.W.7, was appointed receiver and manager on May 20th, 1935, under powers contained in debenture dated March 4th, 1935.

Neon Manufacturers, Ltd.—Mortgage dated May 23rd, 1935, to secure £250 charged on contracts as therein mentioned subject to the first mortgage debenture and the mortgage dated May 18th, 1935. Holders: Tudor Investment Trust, Ltd., 84, Temple Chambers, E.C.4.

Microfuses, Ltd.—Capital, £100 in £1 shares. Return dated December 11th, 1934 (filed February 28th, 1935). All shares taken up. £100 paid. Mortgages and charges, nil.

Singaphones, Ltd.—Capital, £1,000 in £1 shares. Return dated December 22nd, 1934 (filed May 28th, 1935). 150 shares taken up. £100 paid. £50 considered as paid. Mortgages and charges, nil.

North London Valve & B.U.R.T.S., Ltd.—Capital, £2,000 in 7,600 cumulative preference shares of 5s. and 2,000 ordinary shares of 1s. Return dated December 19th (filed May 3rd, 1935). 3,000 preference and 1,802 ordinary shares taken up. £500 2s. paid on 2,000 preference and 2 ordinary shares. £340 considered as paid on 1,000 preference and 1,800 ordinary shares. Mortgages and charges, £8,500.

British Dry Cell Co., Ltd.—C. Wakeling, 8, Serjeants Inn, E.C., ceased to act as receiver on April 30th, 1935.

Omic, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £500. The additional capital is divided into 500 ordinary and 1,500 8 per cent. cumulative preference shares of £1.

Radio Service (Southern), Ltd.—Capital, £500 in £1 shares. Return dated December 18th, 1934 (filed March 14th, 1935). 101 shares taken up. £2 paid. £99 considered as paid. Mortgages and charges, £500.

City Notes

Richard Johnson & Nephew, Ltd., held their annual meeting on May 30th. Sir Walter Campbell (chairman), who presided, referred to the two or three months' strike at the company's works, and said that the departments concerned restarted on October 10th. When the shops were empty the opportunity was taken to make improvements in the layout. During the past year the wire rod mill was also entirely remodelled, and, when in full operation, would give an increased output. That item was responsible for the reduction in the liquid assets. During the past two years £75,000 had been expended on work of a capital nature. The British Iron and Steel Federation had made considerable progress during the year and a temporary agreement had been reached with the Continental Steel Cartel to limit the imports of steel. The wire industry had not been a party to the preliminary negotiations, but hoped to join in more permanent arrangements which might benefit the industry, especially in the export markets.

Ever Ready Co. (Great Britain), Ltd., held its annual meeting on June 3rd, when Mr. Magnus Goodfellow (chairman and managing director), who presided, said that on the production side many improvements had been effected and on the selling side the demand had been greater than ever before. The trading position of the Continental companies was strong, but by reason of restrictions and exchange difficulties they had not contributed to the year's profits. For the purpose of manufacturing and selling goods overseas they had co-operated with the Union Carbide & Carbon Corporation of the United States in the formation of the International Eveready Co., Ltd. The

company's holding in Lissen, Ltd., was 420,000 ordinary shares of £1 each, fully paid, at a total cost of £742,000, but with the wholesale changes made in the management and organisation this company had necessarily to pass through a transitional period, and it would be shortsighted to value this asset, which they anticipated would show improved trading results in the near future, on a transitional basis. The present year's trading had opened promisingly and the sales to date showed an advance on those for the similar period of last year. An extraordinary meeting followed the annual meeting, at which resolutions were passed converting the issued preference and ordinary share capital into stock.

The Delhi Electric Supply & Traction Co., Ltd., held its annual meeting on May 28th, when Mr. K. A. Scott-Moncrieff (chairman), who presided, said that during 1934 the kWh sold rose by 12 per cent. with about ¾ per cent. increase in the gross revenue derived therefrom. A reduction of charges in May, 1934, led to a substantial increase in output and there was also a voluntary reduction in the street-lighting charges. On the traction side a decrease of 2½ per cent. was shown in the number of passengers carried, but owing to the average length of journey per passenger being greater, the gross revenue increased by 13 per cent. In February last trolley buses were introduced. Negotiations had almost been completed for supplying power to the waterworks. This would mean over 1,000,000 kWh being supplied yearly, and to obtain it the company had to be satisfied with a very small margin of profit. Terms had also been fixed for supplying other large industries, but they could not go far in this direction unless they could obtain a bulk supply on satisfactory terms from the New Delhi or some other steam turbine station. During 1934 they generated 87 per cent. of their requirements, and only 13 per cent. was purchased from the New Delhi Municipality.

Dubilier Condenser Co. (1935), Ltd.—Presiding at the annual meeting held on May 29th, Mr. G. F. Mansbridge (chairman), said that the ordinary dividend had been increased from 10 per cent. to 15 per cent. during the past year and that this could have been larger, but it was considered desirable to place £4,000 to reserve and to increase the amount carried forward. The year had seen substantially more business than in the preceding year, but prices showed a smaller margin over cost owing to the very keen competition. Increased business had led to the extension of the sales and production staff and to additions to plant, test equipment, &c. The company contemplated closing down its Shepherd's Bush factory and concentrating all production at the Acton works. This would increase the production capacity and increase efficiency. They were prepared to make all television apparatus that was appropriate to their factories, and future prospects indicated that the demand would be on the same lines as in the past year.

The British Electric Traction Co., Ltd., reports a net profit for the year ended March 31st last of £378,981, and after deducting debenture interest there is a balance of £299,502. It is proposed to pay a final dividend of 4 per cent. on the preferred ordinary stock, making 8 per cent., and 2½ per cent. on the deferred ordinary stock, making 5 per cent., leaving a balance of £126,087. Of this balance it is proposed to capitalise £49,100 (equal to 10 per cent. on the deferred ordinary stock) and to apply it in paying up in full 49,100 deferred ordinary shares of £1 each, which will be distributed among the holders of the deferred ordinary stock and subsequently converted into deferred ordinary stock. Holders of the preference stock will also receive a further 2 per cent., making 8 per cent. for the year.

Enfield Rolling Mills, Ltd., in its interim report, states that during the six months to March 31st last the output in certain departments had not come up to expectations owing to labour difficulties and unforeseen delays. These difficulties have now been surmounted and the output is improving. A contract has been entered into for the acquisition of the London Zinc Mills on amalgamation terms. Mr. Sidney Hunn, who has been associated with the Zinc Mills for over twenty-five years and is now managing director, will join the board of Enfield Rolling Mills. Production will be gradually transferred to the new works of the Enfield Rolling Mills at Brimsdown, and additional plant is already being installed so that the full demands of the home market can be met.

The Para Electric Railways & Lighting Co. reports gross receipts for the year ended November 30th last of £122,734, as compared with £153,249 in the preceding year. The net revenue was £42,713, and after meeting London expenses, debenture interest, &c., there was a loss of £9,292, which has been written off general reserve. A payment of 1½ per cent. on account of debenture interest was made on June 1st, 1934, but it was not possible to make any further payment during the year. A further 1½ per cent. interest payment was made on February 1st. Meeting: June 17th.

Telephone Rentals, Ltd., reports net profits for the year ended May 31st last amounting to £72,799, as compared with £59,528 for 1933-34. A sum of £10,000 is placed to general reserve, and it is proposed to pay a final dividend of 4½ per cent., making 8 per cent. for the year (against 7½ per cent.), leaving £24,124 to be carried forward. The report states that all the subsidiary operating companies except one worked at a profit. It is proposed to offer a further 400,000 5s. shares to shareholders at 7s. 6d. each in the proportion of one new share for every six held.

Ultra Electric (Holdings), Ltd.—Particulars were published on Tuesday last, for information only, of this company which has been formed to acquire the whole of the issued share capital of Ultra Electric, Ltd., manufacturers of radio receiving sets, consisting of 180,000 ordinary £1 shares. The purchase consideration payable by the company for the acquisition of such share capital is £198,998 5s., to be satisfied by the allotment, credited as fully paid, of 795,993 shares of 5s. each in the capital of the company.

Madras Electric Supply Corporation, Ltd., reports a net profit for 1934 of £73,806 (against £77,269 for 1933) after providing £50,000 for depreciation and renewals. A final ordinary dividend of 5½ per cent. is recommended, making 8 per cent., tax free, for the year (same), leaving £26,858 to be carried forward. During the year generation costs were considerably reduced and kWh sold increased by 4.7 per cent. compared with 1933, but the gross revenue declined by 1.1 per cent. owing to a reduction in tariffs from July 1st.

Cable & Wireless (Holding), Ltd.—The Court of Directors has considered the possibility of applying part of the liquid resources of the Group in reduction of the amount of the paid up preference capital of the company and has decided that without prejudice to the business and after providing for all probable contingencies, £7,739,625 could be so applied. Inasmuch as the 5½ per cent. cumulative preference stock is entitled to priority over other stock, any repayment of the capital from the assets of the company must be a repayment of a proportion of such stock. The company now offers to purchase at par (up to June 25th) one-third of the 5½ per cent. cumulative preference stock together with all arrears of dividend thereon, and the stock so purchased will be cancelled and the capital of the company reduced accordingly.

The Young Accumulator Co. (1929), Ltd., reports a net profit of £6,156 for the year ended March 31st last, as compared with £5,686 for the seven months' trading period to March 31st, 1934. This profit is utilised in writing off expenditure on development, advertising, &c., carried forward at March 31st, 1934, and the expenditure in connection with patents, development, &c., during 1935. The balance forward is raised from £56 to £1,730. Meeting: June 12th.

Ward & Goldstone, Ltd., have declared a dividend of 10 per cent. on the ordinary shares for the year ended March 31st last. It is proposed to capitalise a sum of £6,446 and to issue it to ordinary shareholders in the form of fully-paid ordinary shares of 5s. each, ranking *pari passu* in all respects with the existing issued ordinary shares in the proportion of one share for every ten shares held.

W. T. Henley's Telegraph Works Co., Ltd., has announced a final ordinary dividend of 2s. 6d. per share, less tax, making 4s. per share (20 per cent.), for the year. In addition, it is proposed to pay a cash bonus of 2s. per share, less tax. The total distribution for the year is thus maintained at 30 per cent.

Jersey Electricity Co., Ltd., reports a balance for 1934 of £14,292 (against £13,319 for 1933), after providing for depreciation and reserve and adding £4,294 brought in. A final dividend of 12½ per cent. (against 10 per cent.) is announced, making 15 per cent. for the year as compared with 12½ per cent. for the previous year, and £4,392 is to be carried forward.

Bennis Combustion, Ltd.—The subscription list was opened on Wednesday last for the issue of 100,000 6 per cent. cumulative preference shares of £1 each at par and 100,000 ordinary shares of 5s. each at 5s. 6d. per share. The company has been formed to take over the business of Edward Bennis & Co., Ltd., and the Deansgate Foundry Co., Ltd.

The North-Eastern Electric Supply Co., Ltd.—Messrs. Lazard Bros. & Co. announce that the application list which was opened on May 30th for the offer of £1,500,000 3½ per cent. consolidated debenture stock was closed on the morning of the same day.

The Electric Construction Co., Ltd., has announced a dividend of 3½ per cent., less tax, on the ordinary shares. This is the first distribution on the ordinary capital since the payment of 5 per cent. in respect of the year to March 31st, 1930.

The West Devon Electric Supply Co. is holding a meeting on June 12th at which a resolution will be submitted for increasing the capital to £350,000 by the creation and issue of 100,000 ordinary £1 shares.

Crompton Parkinson, Ltd., have announced an interim dividend at the rate of 6 per cent. actual on the ordinary and "A" ordinary shares.

The Globe Telegraph & Trust Co., Ltd., has declared a final ordinary dividend of 2 per cent., making 3½ per cent., tax free, for the year (against 2½ per cent. for 1933-34.)

The Brazilian Traction, Light & Power Co. has announced a quarterly dividend of 1½ per cent. on the preference shares.

Stocks and Shares

TUESDAY EVENING.

THE general aspect of Stock Exchange markets has been coloured by the influx of capital into British securities of all kinds, more particularly Government and industrial. It is true that business in most of the markets is at once spasmodic and sporadic, but the fact remains that money is definitely flowing into British stocks and shares, and giving a miss, to put it colloquially, to foreign securities. The result is seen in an all-round strength of British stocks, gilt-edged and otherwise. The excitement caused by the Cable and Wireless offer has subsided to some extent. Prices of the trio are not quite so exuberant as they were. There has been a little selling on behalf of people who can now get out at a good profit upon their purchase prices. It is not everyone, however, who wishes to take a third part of his preference stockholding in cash.

The stocks of the Central Electricity and other public boards are maintaining their previous prices. London Passenger "C" stock continues to revolve around 100. Making allowance for the deduction of interest on Monday in this week, several of the fixed-interest issues are higher.

Electricity Supply Shares

The Northampton Electric Light & Power Co. has invited subscriptions from its shareholders to an issue of 145,000 ordinary shares of £1 each at 44s. per share, one new share being offered for each five old shares held. The price of the latter is now 53s. 9d. ex rights. Yorkshire Electrics are a little easier at 44s., Midland Counties at 37s. Lancashires can be bought at 39s. The shareholders have resolved to increase

the capital to 3½ million pounds by the creation of 400,000 ordinary shares of £1 each, ranking in all respects *pari passu* with the existing ordinary shares. The West Devon Electric Supply Company is to hold a meeting on Wednesday in next week, to consider raising the capital by the issue of 100,000 additional ordinary shares of £1 each. The present price of the shares is 25s. 6d. ex dividend. The company paid 4 per cent. for last year. West Gloucestershire ordinary is steady at 96: the preference has risen 3 points to 133 and is very scarce. Business has started in the 3½ per cent. consolidated debenture stock of the North Eastern Electric Supply Company. Of this stock, 1½ million pounds was offered for sale at par. Applicants up to £5,000 received allotments in full. Larger subscriptions obtained about 97 per cent. The price of the scrip is about par—that is, 100. The newly issued Charing Cross 3½ per cent. debenture holds its price at 101½.

There has been a little buying of Palestine "A" shares, causing the price to harden to 38s.

Manufacturing and Equipment Shares

Crompton Parkinsons have been an outstanding feature of animation, the buying being based upon hopes of an issue on bonus terms during the present year. The company is known to be doing exceedingly well. The interim dividend is maintained at 6 per cent. Some thought that this announcement would have the effect of causing a certain amount of disappointment, and of bringing shares to market. As things turned out, the reverse was the case, the interim dividend being completely ignored in the anxiety to acquire shares at anything like 52s. 6d.

Aron Electricity ordinary have lost the improvement that they picked up last week on the declaration of the increased dividend. The price eased off to 66s. 3d. Enfield Cables keep hard at £5. Enfield Rolling Mills improved to 30s. upon the announcement that the company has entered into a contract to acquire the London Zinc Mills on amalgamation terms. The Electric Construction Company has declared a dividend of 3½ per cent. on the ordinary shares, the first for five years. The price rose 1s. 6d. last week, and this improvement to 19s. has been maintained. Telegraph Constructions are 1/8 better at 23s. 9d., on the hope, already mentioned here, of an early return of the shares to the dividend list. General Electrics retain their advance to 56s. 3d., and the 6½ per cent. preference keep good at 35s. An inquiry came in for Brush ordinary, and stock changed hands up to 47. Speculation argues that Brush ordinary stock may possibly return to the dividend list.

The Cable and Wireless Offer

The official notice of Cable & Wireless, published on Tuesday in this week, shows that the preference stockholder has the right to sell to the company one-third of his holding at the rate of £100 for each £100 nominal preference stock, he—the proprietor—relinquishing all arrears of dividend. He may also accept the offer for a larger amount, in the event of other holders parting with less than a third of their holdings. The offer is set out in very fair terms, the directors stating explicitly that each holder is free to accept or reject as regards the whole or any part of his holding. They themselves recommend the scheme, and have undertaken individually to accept the offer, subject to retaining their necessary directors' qualifications. There is a good deal to be said on both sides of the question, but on the whole, unless special circumstances supervene, it would seem in the interests of the preference stockholder to take advantage of the present proposal.

Miscellaneous Matters

The Telephone Rentals Company has again increased its dividend by ½ per cent., raising the distribution for last year to 8 per cent. The profits are up from £59,500 to £72,800. A new issue of capital is to be made on bonus terms. The price of the 5s. shares is now 9s. 6d. Telephone Manufacturing (1929) stand at 6s. 9d.

Dealings are expected to start in the course of a few days in the shares of Ultra Electric (Holdings). The company has been established to acquire Ultra Electric, Ltd., which produces radio receiving sets. This company's profits have risen from £25,200 for the year ended April, 1932, to £49,500 for the year ended April 26th last. The present authorised capital is £250,000 in one million ordinary shares of 5s. each, of which 800,000 shares are issued and fully paid.

British Electric Traction deferred is unchanged at 97.5: the company's annual report exhibits an impressive advance in net earnings. American traction and utility issues are somewhat erratic. American "Tel. and Tel." is a point higher. Brazilian Tractions reacted after their last week's burst of strength, Brussels coming in a seller. The latest-of-all crisis in France led to Continental offering of stocks and shares in which the French are interested. Gt. Northern Telegraphs shed £1 of their recent sharp rise. Capital, it may be repeated, is going mainly into British investments. Iron and steel shares are very popular just now. Revival of interest in television shares is noticeable, more especially in regard to Bairds; the three classes of shares are better in price. On the other hand, Electric and Musical Industries have been dull at 25s.

Rubber shares derived a modicum of encouragement from a rise to slightly over 6d. per lb. in the produce. Business has not been of sufficient volume, however, to necessitate any cancellation of important appointments with clients at Epsom.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend 1933.	Dividend 1934.	Price. June 4.	Rise or Fall.	Yield. p.c. £ s d.
Bournemouth and Poole	1	15	15	76/3	—	3 18 9
Brompton Ordinary	1	7	7	33/6	—	4 3 7
Charing Cross Ordinary	1	7	7	33/9	—	4 3 0
Chelsea	1	7	7	33/6	—	4 3 7
City of London	1	7½	7½	36/–	—	4 3 4
Clyde Valley	1	7	8	42/6	—	3 15 2
County of London...	1	10½	10½	57/–	–6d.	3 13 8
Edmundson's 7% Pref.	1	7	7	36/–	+6d.	3 16 9
Elec. Dis. Yorkshire	1	9	9	48/–	—	3 15 0
Elec. Supply Corporation ...	1	11	11	3 1/8	—	3 11 10
Kensington Ordinary	1	7	7	33/6	—	4 3 7
Lancs Light and Power	1	7½	7½	39/–	–6d.	3 17 0
London Electric	1	7	8	37/6	—	3 14 8
Metropolitan	1	10	10	53/–	—	3 15 6
Midland Counties	1	7	7	37/–	–6d.	3 15 8
Mid. Elec. Power	1	8	8	40/–	—	4 0 0
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 8
Do. 7% Pref.	1	7	7	35/6	—	3 19 0
Northampton	1	10	10	53/9xr	—	3 14 1
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary ...	1	10	10	61/3	—	3 5 6
Do. do. 6% Pref.	1	6	6	32/–	+6d.	3 15 0
St. James and Pall Mall	1	7	8½	33/6	—	4 18 6
Scottish Power	1	8	8	41/9	—	3 16 8
South London	1	7	7	35/–	—	4 0 0
Westminster Ordinary	1	7	7	33/6	—	4 3 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	44/–	—6d.	3 12 9

PUBLIC BOARDS.

Central Electricity, 1950–70 ...	Stock	5	5	116	—	4 6 2
Do. 1955–75 ...	,,	5	5	118	—	4 4 9
Do. 1951–73 ...	,,	4½	4½	110xd	—	4 1 10
Do. 1963–93 ...	,,	—	3½	101	+1	3 10 0
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A...	,,	—	4½	124½xd	+1½	3 12 3
Do. do. B...	,,	—	5	127½xd	—	3 18 9
Do. do. C...	,,	3	—	100	—	3 0 0
West Midlands Joint Elec. 1948–68	,,	—	5	115	—	4 7 0

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	122½	+1	7 7 0
Anglo-Am. Tel. Pref.	Stock	6	6	116½	—	5 3 0
Do. Def.	,,	1½	1½	27½	+½	5 9 1
Cable & Wireless 5½% Pref. ...	,,	2¾	4½	98	+1	4 5 3
Do. A. 7½% Ord.	,,	Nil	Nil	23½	—½	—
Do. B. Ord.	,,	Nil	Nil	7½	—¼	—
Globe Tel. & Tel. Ord.	10	2½	3½	14½	—½	2 9 3
Do. do. Pref.	10	6	6	14½	—½	4 2 9
Great Northern Tel.	10	20	20	40½	—1	4 18 5
Marconi-Marine	1	10	7½	32/6	+5d.	4 12 4
Oriental Telephone Ord.	1	12	12	3 1/8	—	*3 12 5

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	975	—	—
Do. do. Pref. Ord.	,,	8	8	173½	—	4 12 2
Brazil Traction	100	—	—	9½	—½	—
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	92½	—	5 8 1
Mexican Light Common	100	Nil	Nil	3	—1	—
Do. 7% Pref.	100	7	7	5½	—	—
Do. 1st Bonds	$500	5	5	42½	—	—
Victoria Falls Ord.	1	15	20	7⅞	—	2 14 6
Yorkshire (West Riding) ...	1	5	6½		—	4 0 0

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	66/3	—1/8	4 16 0
Assoc. Elec. Ord.	1	4	6	28/6	—	4 4 3
Do. Prf.	1	8	8	37/–	—	4 6 4
Babcock & Wilcox	1	6	8	44/–	—	3 12 9
British Aluminium Ord.	1	5	7½	36/–	—1/–	4 3 4
British Insulated Ord.	1	5	15	4 1/4	—	3 14 0
Brush Ord.	Stock	Nil	Nil	46½	+8½	—
Callender's	1	15	15	3½	—	4 5 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/–	—	12½	2½	—	1 3 3
Do. 8% Pref.	1	8	8	36/3	—	4 8 5
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	Nil	19/–	—	—
Enfield Cable Ord.	1	25	25	5	—	5 0 0
English Electric	1	Nil	Nil	12/3	—	—
Do. do. Pref.	1	Nil	Nil	18/3	—	—
Ever Ready	5/–	35	35	21/9	—	8 1 0
Ferranti Pref.	1	7	7	28/0	—6d.	5 0 0
G.E.C. Pref.	1	6½	6½	35/–	—	3 14 4
Do. Ord.	1	8	8	56/3	—	2 17 2
Henley's	1	30	30	6¾	—	4 9 0
Do. 4½% Pref.	5	4½	4½	5¾	—	3 16 8
India-Rubber Preferred	1	—	5½	1¼	—	4 17 9
Johnson & Phillips	1	5	7½	36/3	—	4 2 9
Siemens Ord.	1	6½	4	1½	—	3 11 1
Telegraph Construction	£1	Nil	Nil	1 1/8	+1/8	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

30759. "Electrical storage batteries." J. D. Doyle, M. K. Doyle, E. L. Caton and J. J. Malone. October 30th, 1933. (428074.)

1933

27181. "Direction-finding apparatus." British Thomson-Houston Co., Ltd. October 26th, 1932. (428212.)

27763. "Alternating-current commutator machines." Crompton Parkinson, Ltd., and R. A. W. A. Lochner. October 9th, 1933. (Cognate application 35462/33.) (428214.)

27924. "Control of electrically propelled vehicles." British Thomson-Houston Co., Ltd., and J. H. Cansdale. October 10th, 1933. (428242.)

27925. "Thermionic valve and like circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. October 10th, 1932. (428285.)

29727. "Switching system for the electrical circuits of automobiles." F. Harris. October 26th, 1934. (Cognate application 9151/34.) (428054.)

30059. "Illuminating devices." G. V. Downer. October 30th, 1933. (Cognate application 30937/33.) (428057.)

30485. "Supply or control of power in electric traction systems." General Electric Co., Ltd., and C.C. Garrard. November 2nd, 1933. (428066.)

30597. "Station indicators or tuning devices for wireless receiving or transmitting apparatus." J. H. Naden and C. H. G. Galloway. November 3rd, 1933. (Cognate application 18532/34.) (428139.)

30763. "Radio receivers or the like." D. W. Pugh and Baird Television, Ltd. November 6th, 1933. (428371.)

30808. "Electrical circuit-breakers." British Electrical & Allied Industries Research Association and W. B. Whitney. November 6th, 1933. (Cognate application 15937/34.) (428071.)

30979. "Sealing devices for electric cable ends." British Thomson-Houston Co., Ltd. November 7th, 1932. (428079.)

30997. "Wireless receiving systems." Dr. J. Robinson. November 7th, 1933. (428081.)

31030. "Electro-acoustic translating devices." P. W. Willans. November 8th, 1933. (Cognate application 7395/34.) (428144.)

31130. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and J. H. Mitchell. November 8th, 1933. (Cognate application 6200/34.) (428084.)

31239. "Television systems." Fernseh Akt.-Ges. November 15th, 1932. (428227.)

31265. "Galvanic batteries." Oldham & Son, Ltd., and H. Holt, Jnr. November 9th, 1933. (428374.)

31383. "Arrangements for use in electric signalling systems." Standard Telephones & Cables, Ltd. November 25th, 1932. (Cognate application 31384/33.) (428293.)

31385. "Electron-discharge devices and circuit therefor." Standard Telephones and Cables, Ltd. November 10th, 1932. (428294.)

31572. "Rapid process of photography applicable in television and for other purposes." W. W. Groves (I.G. Farbenindustrie Akt.-Ges.). November 13th, 1933. (Convention date not granted.) (428382.)

31592. "Projection of light." Edison Swan Electric Co., Ltd., and H. C. Wheat. November 13th, 1933. (428387.)

31620. "Trunk-communication cable installations for the transmission of low-frequency and high-frequency currents." Siemens & Halske Akt.-Ges. November 12th, 1932. (428392.)

31891. "Apparatus for testing the ignition devices and circuits of internal-combustion engines." J. Weidenhoff, Inc. December 3rd, 1932. (428235.)

32300. "Incandescent electric lamps." E. R. Grote. November 2nd, 1933. (428236.)

32987. "Electric-arc fusion welding and electrode holders therefor." J. H. L. Bridge. November 25th, 1933. (Cognate application, 32988/33.) (428395.)

33565. "Electric-arc fusion welding and electrode holders therefore." J. H. L. Bridge. November 30th, 1933. (Cognate application 3152/34.) (428396.)

33596. "Vapour-electric convertors." General Electric Co., Ltd., and E. Gall[illegible]a. November 30th, 1933. (428089.)

35611. "Twin [illegible]trical conductors." General Electric Co., Ltd., and C. J. [illegible]aithells. December 18th, 1933. (428094.)

1934

96. "Electrical control systems for illumination apparatus, associated with musical instruments, and producing spectacular effects." J. Compton Organ Co., Ltd., and A. H. Midgley. January 1st, 1934. (428399.)

265. "Electrically heated hot-plates." W. Needham and Associated Electrical Industries, Ltd. January 3rd, 1934. (428400.)

284. "Boxes fitted with electrical switches." F. R. Pendergast, S. E. Sheerman and United Electric Co. (Birmingham), Ltd. January 4th, 1934. (428098.)

799. "Electrically conductive swivel joints and the application thereof to illuminated mirrors." F. T. Dudley. January 9th, 1934. (428099.)

1848. "Induction control apparatus for use in electric motor starters." R. H. Barbour. January 18th, 1934. (428402.)

4542. "Collector for electric current." T. Bolton & Sons, Ltd., W. E. Alkins and W. Cartwright. February 12th, 1934. (428111.)

5260. "Apparatus for producing electrical impulses of very high voltages." A. Brasch and F. Lange. February 16th, 1933. (Addition to 389813.) (428405.)

5855. "Electric circuits comprising gasfilled triodes." General Electric Co., Ltd., and D. C. Espley. February 22nd, 1934. (428324.)

11696. "Electric incandescent lamps." British Thomson-Houston Co., Ltd. April 20th, 1933. (428414.)

13556. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. May 17th, 1933. (428165.)

15873. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. May 26th, 1933. (428168.)

22228. "Electrical heating bars and methods of producing the same." H. Hofer. July 30th, 1934. (428175.)

26107. "Means for amplifying photo-electric currents." E. Bauer Ges. September 11th, 1933. (428183.)

26198. "Electric incandescent lamps." General Electric Co., Ltd., and J. H. Timmins. September 12th, 1934. (428340.)

32965. "Systems for reproducing sounds in their proper relative locations." Electrical Research Products, Inc. November 21st, 1933. (Cognate application, 32966/34.) (428277.)

34737. "Electric motor control systems." Electrical Apparatus Co., Ltd., R. H. Barbour and J. R. Walton. December 3rd, 1934. (428349.)

35547. "Electric switches enclosed in casings." Felten & Guilleaume Carlswerk Akt.-Ges. December 23rd, 1933. (428201.)

35882. "Control grids for gas or vapour discharge tubes." Jenaer Glaswerk Schott & Gen. December 16th, 1933. (428202.)

35983. "Electric converting systems." British Thomson-Houston Co., Ltd. December 16th, 1933. (428351.)

36135. "Plug-and-socket couplings for electric conductors." Siemens-Schuckertwerke Akt.-Ges. December 16th, 1933. (Addition to 340363.) (428203.)

1935

2215. "Devices for the irradiation of milk with ultra-violet rays." Hanovia Chemical & Manufacturing Co., Ltd. March 15th, 1934. (428434.)

2425. "Protective circuit arrangement for installations, comprising a remotely controlled automatic electric switch." J. T. Shevlin (Siemens-Schuckertwerke Akt.-Ges.). January 24th, 1935. (428357.)

2791. "Electric discharge devices." General Electric Co., Ltd. March 9th, 1934. (428358.)

2806. "Current collectors for electric vehicles." C. L. Delachaux. January 28th, 1935. (428435.)

10740. "Potential changers." P. R. Mallory & Co., Inc. September 27th, 1932. (Divided out of 26464/33.) (428204.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 29th:—

Aerofrige. No. 557811. Class 6. Refrigerating machines.—British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, E.C.1.

Zerad (lettering and design). No. 556490. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Zenith Radio Corporation, Chicago. (British representatives: Lloyd Wise & Co., 10, New Court, Lincoln's Inn, W.C.2.)

Corona. No. 559746. Class 8. Advertising and display signs illuminated by neon tubes or lamps, or by like discharge tubes. —Neon Erectors, Ltd., 76, Rosamond Street East, Manchester.

BSS 546. No. 556715. Class 13. Two-pole and earthing pin plugs and socket outlets and parts of such goods.—British Standards Institution, 28, Victoria Street, Westminster, S.W.1.

Belplastic. No. 559735. Class 50. Compositions mouldable under pressure and heat made from or having a basis of cellulose acetate or other derivatives of cellulose or synthetic or natural resins, &c.—Belplastic, Ltd., Hayden's Place, Portobello Road, W.11.

[CORRECTION.—Messrs. Holophane, Ltd., ask us to point out that the name registered for their non-inflammable colour screen is "Holnoblase"—not "Holnoblane" as printed in our last issue.]

Electric Cooking in Canteens

IN its efforts to improve working conditions the German Kraft durch Freude ("Power through Contentment") organisation is paying special attention to workers' mess rooms. The rooms themselves are made bright and cheerful, says *Elektrotechnische Zeitschrift*, and electric heating and cooking equipment is chosen for the kitchens on the principle that "the best only is good enough." From a chart by F. Mörtzsch in *Deutsche Technik* it appears that the load is as follows:—

No. of persons.	Hot plates	Ovens	Boilers	Miscellaneous	Total
	kW.	kW.	kW.	kW.	kW.
100	13.4	6.7	13.4	6.7	40
200	16.6	10.0	25.0	8.3	60
400	23.4	13.4	50.0	13.4	100
600	30.0	16.6	73.0	20.0	140

Large electric kitchens of this type are found to be thoroughly economical, whether with private power plant or purchased supply, because they do not contribute to the peak load and increase the fixed charge in the electricity bill; in fact, they improve the load factor and increase by about 15 per cent. the "hours of utilisation" of the maximum demand. In canteens with partial catering the load consists largely of hot cupboards for warming meals brought by the workers, and of water heaters for making coffee. The water can be heated to 185 deg. F. by energy at cheap night rates. The daily consumption of equipment capable of supplying 100 cups of coffee per hour is given as 2.8 kWh, rising to 4 kWh for 200 cups, 7.5 kWh for 400 cups and 11 kWh for 600 cups per hour. Similar water-boiling equipment is also used in many large garages, railway porters' rooms, and other establishments of this nature.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abram (LANCASHIRE).—Church; Austin & Paley, architects, Castle Park, Lancaster.

Ayr.—Houses (27), Heathfield Road; E. Ecrepont, builder, Berelands Road, Prestwich.

Barking.—Dwellings, Upney Lane (£20,535); borough engineer. School, Manor site (£42,434); G. H. Miller & Co.

Barrhead (RENFREWSHIRE).—Houses (214); burgh surveyor.

Barwell.—Extensions to works, H. Leader & Co., Ltd., Chapel Street; J. Lockley, builders, Barwell, Earl Shilton, near Hinckley.

Birmingham.—Shops and flats, Broad Street (£35,000), for Lt.-Col. Baldwin Webb; White & Styles, architects. Welfare centre, Tennall Hall, Harborne; city engineer. School (1,920 places), Beeches Road (£60,390), for E.C.

Brierley Hill.—Houses (61), Saltwells Road, Quarry Bank; U.D.C. surveyor.

Bristol.—Houses (44), Knowle Estate; city engineer. Houses and flats, Bedminster Estate (£24,072); E. A. W. Poole & Sons.

Bromley.—Alterations, Raglan Road School; F. H. Wood, quantity surveyor, 19, Charing Cross Road, London, W.C.2.

Burslem.—Houses, near Leek Road; A. Gurney.

Bury.—Houses (28), Mount Zion Estate, Manchester Road, near Dumers Lane; F. A. & R. Lever, builders, 49, Lilywhite Street, Whitefield, Manchester. Cinema (£50,000) for Proprietory Estates, Ltd., Manchester; David Rosenfield, chairman. Cinema, Bolton Street, for Bury Cinematograph Co., Ltd.

Chelmsford.—Third section of Essex County Hall (£93,241); county surveyor. Junior school, South Ward, for E.C.

Cheshire.—Primary school, Timperley; F. A. Browne, county architect, The Castle, Chester.

Croydon.—Houses (294), Blurton Green Estate, Fenton; Ball & Robinscn.

Droylsden.—Houses (88), Alderdale Estate, Edge Lane; W. Farley, builder, West Street.

Dudley.—Administrative block, Dudley Guest Hospital; Management Committee.

Dundee.—Hospital, Westgreen Mental Hospital; city architect.

Eastcote (MIDDLESEX).—Reconstruction, St. Vincent's Orthopædic Hospital; Governors.

Eccles.—Telephone exchange, Regent Street, for H.M. Office of Works, King Charles Street, London, S.W.

Edgware.—Estate development near Edgwarebury Lane; F. Howkins, 1, Russell Parade, Golders Green, N.W.11.

Enfield.—Houses, Brick Lane, and shops, Chase Side; E. D. Judd. Houses (40), Falcon Crescent; Ferndale Estates, Ltd. Houses (130), Grove Estate, Turkey Street; Swannell & Sly. Houses (42), Ladysmith Road; W. Marsden & Co. Houses, Ordnance Road; C. V. Cable. Houses (939), South Lodge Estate; J. Laing & Son, Ltd. Baths and fire station, Adeline Nursery site; U.D.C. surveyor. Factory, Hertford Road; Murex Welding Process, Ltd. Shops and houses, Adelaide House Estate, Forty Hill; Harwood Nash & Co. Regal Cinema (2,000 seats), London Road; R. Cromie, architect, 35, Baker Street, London, W.1.

Epsom.—R.C. church and presbytery, Walsingham Gardens; Atkinson & Marler. Public library, art school, and fire brigade and ambulance stations; U.D.C. surveyor.

Faringdon.—Houses (52); R.D.C. surveyor.

Flaxton (YORKSHIRE).—Houses (26), Beech Avenue Estate; E. Sherrey.

Glasgow.—Factory (£20,000), for Farquharson Bros., Ltd., Holland Street; the manager, Shops and houses, Barrhead Road; D. Beaton, 35, Melville Road, Pollokshields.

Golborne.—Houses (128), Dove House Farm Estate; Maxwells Estates, Ltd., builders, 216, Seabank Road, Wallasey.

Gosforth (NORTHUMBERLAND).—Additions, W. J. Sanderson Orthopædic School; T. Curry and Son, builders, Meldon Street, Newcastle-on-Tyne.

Gravesend.—School (1,400 places), Westcourt Housing Estate; director of education.

Guildford.—Houses (100), Bannisters Farm Estate; H. Ashenden.

Halifax.—Senior school, Ovenden district (£24,204), for E.C.

Hanley.—Reconstruction, Hanley Pottery; Johnson Bros. (Hanley), Ltd.

Harrogate.—Cinema, East Parade, for Odeon Theatres, Ltd.; W. G. Elcock, secretary, 39, Temple Row, Birmingham.

Hatfield.—Houses (74), Birchwood Garden Estate; R.D.C. surveyor. Houses (100), Lemsford Road; English and Scottish Estate Co., Ltd.

Heaton.—Aerodrome; Lancaster and Morecambe Corporations.

Hexham (NORTHUMBERLAND).—Houses (118) Bog Acre Estate; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne.

Hillingdon.—Houses (68), Evelyn's Estate; H. A. and R. J. Steel.

Hindley.—Electric lighting installation, National Spiritualist Church; W. H. Yates, secretary, 24, Close Street.

Ilford.—Houses (29), Abbotswood Gardens; A. Smith & Son. Houses (38), Mighell Avenue; P. G. Ashton & Sons.

Kendal.—Houses (100), Glebe Fields; W. Townson & Sons, Ltd., Park Hill Street, Bolton.

Kingston-on-Thames.—Extensions, factory (electrical work), for Vine Products, Ltd.

Lanarkshire.—Primary school, Forth; J. Stewart, county architect, 20, Albert Street, Motherwell.

Lancashire.—Girls' secondary school, Moorhead, Accrington; county architect, Preston.

Lancaster.—Houses (92), Willow Lane Estate; borough surveyor. Cinema, Spring Garden Street; Odeon Theatres, Ltd.

Leeds.—Houses (1,092) and six combined houses and shops; housing director.

Leicester.—Extensions to works, Polland, Wain & Co., Ltd., High Street Works, Anstey; F. Sleath & Sons, builders, Main Street, Rothley.

London.—(GREENWICH).—Reconstruction, Greek Road School (£58,700); L.C.C. architect. Tenements, Thames Street (£67,000); L.C.C. architect. (KENNINGTON).—Tenements and shops, Park Estate (£30,000); L.C.C. architect. (LEWISHAM).—School. Coopers Lane (£31,315); A. Monk, Edmonton, N. Public library and baths, Downham; borough surveyor. (LIMEHOUSE).—Reconstruction, Central School, Thomas Street (£23,688); L.C.C. architect. (MOTTINGHAM).—Houses and shops (£606,000); L.C.C. architect. (SOUTHWARK).—Buildings, 6-10, Hankey Place; Louis Jacob, 58, Gordon Square, W.C.1. (ST. PANCRAS).—Mental unit, Poor Law Hospital (£31,000); L.C.C. architect. (WANDSWORTH).—Extensions, Technical Institute (£46,883); W. H. Gaze & Son, Ltd.

Loughborough.—College, Frederick Street; Wm. Moss & Sons, builders.

Manchester.—Shops, Clayton Mount Estate, and schools, Wythenshawe Estate (£77,000); city architect.

Middlesex.—Grammar school, Hampton, and secondary school for girls (£93,000); director of education, Eccleston Square, S.W. Schools, Kingston Road, Staines, and Danethorpe Road, Wembley; County E.C. Enlargement, County Hospital, Edmonton (£94,000); county architect.

Motherwell.—Regal Cinema, Windmillhill Street; Cinema Construction Co., Ltd., Glasgow.

Newcastle-on-Tyne.—Premises, Whickham View, for the Co-operative Society; C.W.S. Building department, West Blandford Street.

Newhaven.—Houses (24), Mount Pleasant Estate; U.D.C. surveyor.

Newport (MONMOUTHSHIRE).—Houses (200); F. G. Bruton, architect, 27, Westgate Street, Cardiff. Swimming baths, Maindee (£25,000); borough surveyor.

Northern Ireland.—(STRABANE, Co. TYRONE).—Technical school, Derry Road; J. S. Lawson, architect, Abercorn Square.

Norwich.—Municipal offices (£211,206); Sir Lindsay Parkinson & Co., Ltd.

Paisley.—Houses (2,000), Ferguslie Park; James Lee, burgh engineer.

Penmaenmawr.—Houses (40), Glynllifon Estate; U.D.C. surveyor.

Penrith.—Houses (50); U.D.C. surveyor.

Ponders End.—Extensions, Summerfield Works; T. Morson & Co.

Richmond (YORKSHIRE).—Houses (65), near Walkerville; F. Shepperd & Son, York.

Ripon.—Houses (46), Priest Lane; Ball, Thomas & Lister.

Scunthorpe.—Houses (24), Bottesford Road, Ashley; U.D.C. surveyor.

St. Helens (LANCASHIRE).—Houses (24), Broad Oak Road, for Stephen Molyneux.

Shenley.—Buildings to Mental Colony (£22,792); J. Laing & Son, Ltd.

Shropshire.—Technical college, Abbey Foregate, Shrewsbury (£60,000); director of education, Shrewsbury.

Sittingbourne.—Houses (156), Muddy Lane, for C. Howland.

Southall.—Cinema for the Dominion Cinema Co.

Southgate.—Baths, Winchmore Hill Road (£35,000); borough engineer. Odeon cinema, The Bourne; Bertie Crewe, 75, Shaftesbury Avenue, W.1.

Stirlingshire.—R.C. school (£21,000), Stirling; county architect, Stirling.

Stoke-on-Trent.—Houses (114), Abbey Hulton Estate; city engineer. Houses (28), Lennox Road, Longton; G. F. Norris. Houses, Penkville Street, and near Trentham Road; Holloway & Co.

Swadlincote.—Town hall, public offices, covered market, &c.; U.D.C. surveyor.

Torquay.—School clinic, Barton Hill Road; borough engineer.

Tunstall.—Additions, Royal Albert Pottery; A. Meakin, Ltd.

Twickenham.—Houses (138), Forty Acre Field Estate; G. R. King, borough engineer.

Waddington.—Royal Air Force station (£350,000); Henry Boot & Sons, Ltd., builders, Sheffield.

Wallasey.—Reconstruction, New Brighton ferry pier (£24,000); borough engineer.

Walsall.—Houses (35), Delves; L. Dickinson, builder, Sutton Road. Technical college (£80,000); J. Taylor, surveyor, Council House.

Warrington.—Houses, Sankey Lodge Estate, Liverpool Road, Great Sankey; R. & H. Fletcher, Ltd., builders, Fleetwood Road, Cleveleys, Blackpool.

Watford.—Houses (178), Abbots Garden Estate, Abbots Langley, for Pleasants & Brightman.

Welwyn Garden City.—Houses (84); Simms, Sons & Cooke, Ltd., builders.

Wembley.—Estate development, Harrow Road; Callow & Wright.

West Ham.—Electric lighting installation, Trade School, Water Lane, Stratford, E.; J. H. Jacques, architect, West Ham, Lane, Stratford, E.

West Riding.—Electric lighting to junior boys', Junior girls' and infants' departments, Rossington Council School; A. J. Dempster, Divisional Clerk, Winchester House, Scot Lane, Doncaster. Schools, Armthorpe, Education architect, Wakefield.

York.—Cinema, Fishergate; Winder & Prendergast. Lecture theatre, Haxby Road; Rowntree Village Trust. Additions, County Hospital, Monkgate; Governors.